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The Journal of Occupational Diseases and Traumatic Surgery

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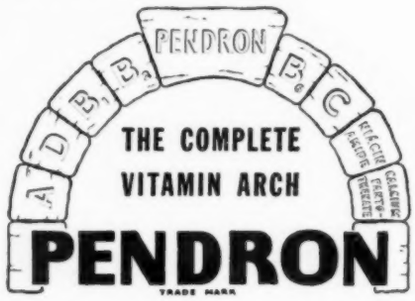

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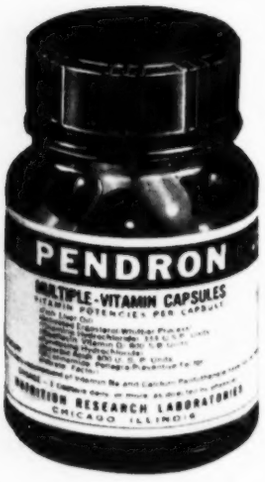

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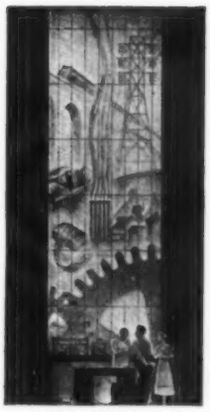

OCCUPATIONAL DISEASES
TRAUMATIC, INDUSTRIAL

INDUSTRIAL MEDICINE
& RAILROAD SURGERY

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This Month

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—Outline for Industrial Nursing Practice

ONE of the highlights of the A.A.I.P. & S. convention at Cincinnati last month was DR. HABEIN'S paper on "The Health of the Executive" (page 218). The terrific tempo of the war effort is putting increased emphasis on the clear head and capable body of the man who is in charge. This emphasis, however, has lagged considerably behind that on the fitness of the worker whose efforts are being directed. The one, however, is fully as essential as the other; executives are fewer in number but they are equal in importance. In the discussion of this paper COLONEL A. J. LANZA said, "I think the part of alcohol is entirely secondary. When the man begins to drink or to take too many cocktails to carry him through the burden of the day, the damage has already been done" . . . THE A.M.A. section on Preventive and Industrial Medicine and Public Health, meeting at Atlantic City next month, has on its program "Results of a Medical and Nutritional Survey of Aircraft Workers" by HENRY BORSOOK, Pasadena, California. Possibly this will be related to the California experiment so widely written about of late and noted elsewhere in these pages . . . DR. SCHWARTZ'S "Dermatitis from Cutting Oils" (page 228) is the final word on disinfectants in such oils. . . . THOSE who heard DR. ROGERS read his "Hospital Management of Industrial Cases" (page 203) were deeply impressed. This author's style is such that it carries over the punch of its own reading to a reading by someone else.

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Write for complete literature.

1. Aldrich, R. H.: "The Story of Burns"—1941, Page 21.
2. McGandy: Minn. Med., January, 1938.

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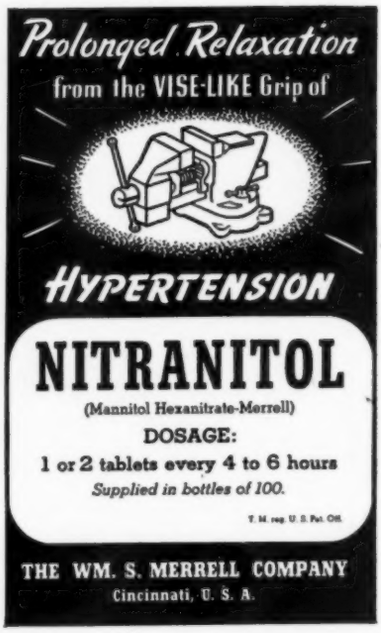

DR. M. H. KRONENBERG, Chief of the Industrial Hygiene, Illinois Department of Health, announces that a consulting nurse for Industrial Hygiene was appointed to his division February 9, 1942.

ANDREW FLETCHER, Vice-President, St. Joseph Lead Company, told the National Conference of Governmental Industrial Hygienists meeting at Washington last month that in 1923 his company spent 10 cents for each $100 of payroll in safety work for its employes. At that time accidents cost the company $3.51 per $100 of payroll. Last year the corresponding figures were 88 cents for safety work, and only $1.03 in accident costs. Thus, while the company spent nearly nine times as

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CAMPHO-PHENIQUE
acts as an analgesic, decongestive and antiseptic. In the treatment of minor skin injuries or simple skin infections, Campho-Phenique provides that triple therapeutic action so essential to encourage rapid healing.
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The powerful germicidal potency of Furmerane, even in weak dilutions, gives it a high place in the prophylaxis and therapy of infections.

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is promptly lethal to a wide variety of organisms, including streptococci, gonococci, staphylococci, spirilla, b. coli and tubercle bacilli as well as protozoa.

The effectiveness of Furmerane has been further demonstrated in the presence of serum, and its safety is indicated by freedom from tissue damage when used in germicidal concentrations. Furmerane is the all-purpose antiseptic.

Furmerane Solution ..... 1:3000—4-oz., pints and gallons
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SEARLE

FOODEX BOOSTS PRODUCTION, AIDS HEALTH!

SCIENTISTS HELP WIN PRODUCTION WAR

Proof Comes From Men Workers Themselves

Today, as never before, production must go on—layoffs due to illness or fatigue must be reduced. In industrial plants everywhere, medical men are learning that there is a scientific answer to the reduction of illness and fatigue resulting from inadequate diets.

The sure answer lies in providing the workers with a between-meal supplement which furnishes all the known vitamin and mineral daily requirements.

Because a recent government report (Stiebeling and Phipard U.S.D.A. No. 507) covering wage earners' families in 43 industrial centers, shows that their diets were badly deficient in vitamins and minerals. For example:

52% lacked in Calcium; 55% in Iron; 75% in Vitamin A; 50% in Vitamin B_1; 52% in Vitamin C; 100% in Vitamin D; 20% in Vitamin B_2. And the Rockefeller Foundation Nutrition Conference recently issued criteria for the recognition of early vitamin deficiency symptoms which included lassitude, fatigue, lack of mental application, loss of strength, nervousness and irritability; muscle and joint pains and many other conditions commonly occurring among workers.

Scientists connected with a leading university report the results of between-meal supplementary feeding with Foodex. 500 men were fed Foodex daily for 60 days—the results were checked with the records of another group of 500 men working in the same plant, doing the same work, who served as controls.

The tables in the center column give the facts of this actual test. The answer is supplied by the men themselves: "Foodex does the real job of making up dietary deficiencies and building health and stamina to stand the gruelling pace of the production war."

HERE'S THE SCORE

Benefits to Health
OF MEN TAKING FOODEX
(From written questionnaires)

General Health Benefits — **80%**
80% of the men taking Foodex reported marked benefits to health in the first 30 days.
A large percentage of them were so enthusiastic that they wanted Foodex continued indefinitely.

Producing Better — **46%**
46% of the men taking Foodex reported they were producing better at the end of the 2nd month.

Less Tense, More Peppy — **21%**
At the end of the first month, 21% of the men reported great improvement in nervous fitness.

Reduction of Fatigue — **71%**
Over 71% reported marked reduction in fatigue at the end of shift (2nd month).

Increased Alertness — **38%**
38% reported increased alertness (2nd month).

Reduction in Colds — **46%**
Over 46% reported reduction in colds (2nd month).

Better Sleep — **46%**
Over 46% reported much improved sleep and feeling of restedness after sleep.

Better Appetite — **43%**
43% reported they were eating better—that their appetite was improved.

Increased Efficiency
OF MEN TAKING FOODEX

Increased Man-day Production Value — **33.9% HIGHER**
The standard labor value per man-day of production of the Foodex group was 33.9% higher than that of the group not taking Foodex.

Increased Earnings — **17% OF THE INCREASE**
17 cents out of every extra dollar earned by the group was attributable to Foodex.

Increased Labor Values in Dollars
Standard labor value per man-day of production in dollars in the last 3 weeks of the test.

	Group Taking Foodex	*Group Not Taking Foodex*
Feb. 12	$10.02	$8.70
Feb. 19	12.00	8.43
Feb. 26	10.92	7.34

Reduction in Work-Days Lost
The usual winter increase in man-days of work lost (during January and February) in the group not taking Foodex was 10 times greater than in the Foodex group.
January and February are the two worst months of the year for colds, grippe, and other winter ailments.

90% Less Increase in Man-days Lost in Foodex Group
Spoilage of materials was 37% less in the Foodex group than in the other group. To be exact, the decrease in spoilage in the Foodex group was 34 cents per man-day of work.

Spoilage of Material Was Reduced 37%

FOODEX SIMPLE ANSWER TO DIETARY PROBLEMS OF WORKERS . . .

Contains Daily Requirements of Vitamins and Minerals

Foodex is a vitamin-mineral enriched palatable food. It is not a medicine. It contains in each portion nine vitamins and eight minerals, plus the four sources of the entire natural B-Complex. From 20 to 30 of the usual size vitamin and mineral capsules or tablets would be required to equal the food factors contained in each portion of Foodex.

Here is the actual comparison of Foodex content with minimum government requirements for vitamins and minerals.

	Daily Minimum Requirements Vitamins and Minerals	*Quantities in 2 Small Cakes of Foodex*
	U.S.P. Units	*U.S.P. Units*
Vitamin A	4000	5000
Vitamin B_1	333	600
Vitamin C	600	750
Vitamin D	400	1000
	mgs.	mgs.
Vitamin B_2 (G)	2	2.25
Calcium	750	1000
Phosphorus	750	800
Iron	10	15
Iodine	0.1	0.15

In addition, science has established the importance of various other vitamins and minerals, which are also present in two little cakes of Foodex—they are: Vitamin B_6 . . . 200 micrograms; Vitamin E . . . 16 mgs. of a concentrate containing natural mixed tocopherols; Nicotinamide . . . 10 mgs.; Copper . . . 1½ mgs.; Manganese . . . 1 mg.; Magnesium . . . 1 mg.; Zinc . . . 1 mg. Plus the entire natural B complex contained in 1 gm. of Yeast, 1 gm. of Wheat Germ, 400 mgs. of Rice Polish and 2.5 gms. of Dry Defatted Milk.

If you want the benefits of Foodex to go to work in your plant—if you want to help in the production war by keeping your workers "up" on dietary requirements, supply them with Foodex Cakes now.

Write today for complete plan. Ask us questions about Foodex and how it can help you defeat employe illness and fatigue. Scientific Nutrition Corporation, Bloomfield, N. J.

Good News

FOR EVERY MAN ENGAGED IN WAR PRODUCTION

Here is how science helped a large group of defense workers attain four important goals—goals which we all strive for! 1. These men increased their production capacity to help win the war; 2. They improved their ability to earn more money; 3. They built up their physical fitness and acquired the extra energy needed to work better over longer periods; 4. They reduced the number of days lost from work (usually due to illness). How did they do it? Every day they ate, in addition to their regular meals, two little, palatable cakes of FOODEX—a new, enriched, concentrated food which contains in definite amounts: 9 important vitamins, 8 essential minerals, and the entire natural B complex.

WHY WAS FOODEX SO BENEFICIAL?

Because statistics show that people are "starving on a full stomach"—starving from a shortage of the precious, healthgiving vitamins and minerals. In fact, the condition was serious enough to have caused the Government to announce that as many as 3 people out of 4 are not getting their daily vitamin and mineral requirements out of foods, and therefore suffer from many deficiencies, with such common symptoms as — weakness, loss of strength, fatigue, nervousness, digestive problems, constipation, and many other minor and major ills which reduce our capacity for work and often cause serious disabilities.

That's why when you eat Foodex every day, your system is definitely supplied with all the necessary vitamin and mineral known daily requirements essential to build buoyant, positive health, added stamina, alertness, and the extra energy required to meet the strain and stress of hard, uninterrupted work and long hours. In fact, improper nutrition is the major health problem in this country. Foodex helps solve it without interfering with regular eating habits. Foodex is a new form of vitamin and mineral insurance that pays large dividends promptly and effectively.

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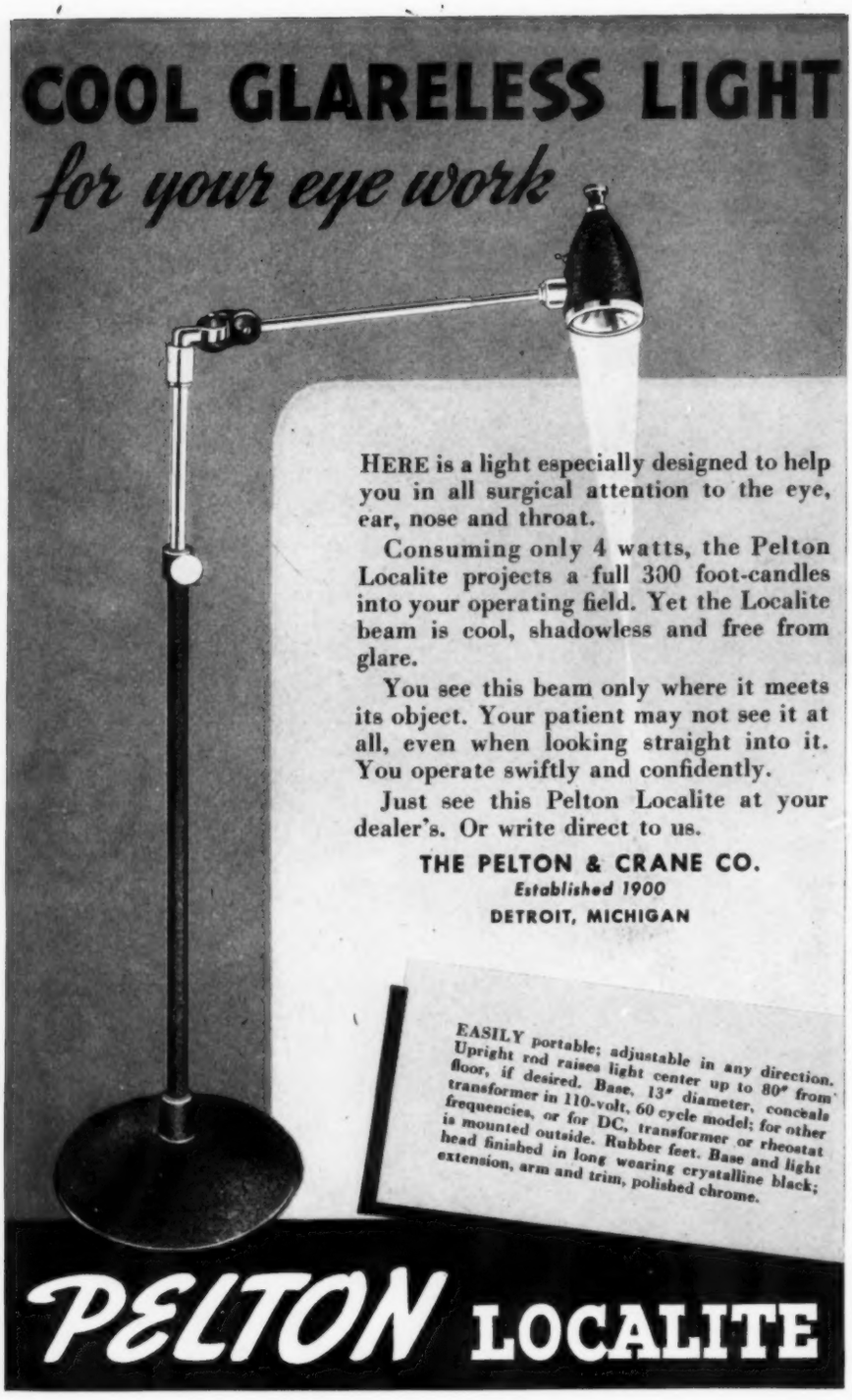
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HERE is a light especially designed to help you in all surgical attention to the eye, ear, nose and throat.
Consuming only 4 watts, the Pelton Localite projects a full 300 foot-candles into your operating field. Yet the Localite beam is cool, shadowless and free from glare.
You see this beam only where it meets its object. Your patient may not see it at all, even when looking straight into it. You operate swiftly and confidently.
Just see this Pelton Localite at your dealer's. Or write direct to us.
THE PELTON & CRANE CO.
Established 1900
DETROIT, MICHIGAN
EASILY portable; adjustable in any direction. Upright rod raises light center up to 80" from floor, if desired. Base, 13" diameter, conceals transformer in 110-volt, 60 cycle model; for other frequencies, or for DC, transformer or rheostat is mounted outside. Rubber feet. Base and light head finished in long wearing crystalline black; extension, arm and trim, polished chrome.
PELTON LOCALITE

much to protect its workers from accidents, it made an overall saving of $1.70 or nearly 50%. This saving applies only to *direct* costs. It doesn't take into account the *indirect* saving, in terms of "the expense of replacing an injured man with the resultant increased cost of supervision, spoilage of material, lower output, plus the cost of repairing equipment that may be damaged in an accident."

H. G. DYKTOR, Chief Engineer, Bureau of Industrial Hygiene, Michigan Department of Health, author of the booklet "Preventive Measures Against all Dermatitis," for the use of non-medical personnel was credited, on page 18 of INDUSTRIAL MEDICINE for April, 1942, with having said something he didn't say. The little abstract there indicated that he recommended the use of a germicidal agent such as phenol in the oil. In fairness to DR. DYKTOR the paragraph, containing the only reference to phenol in his booklet, is quoted herewith:

"Some users developed the idea of disinfecting this used oil by adding thereto a germicidal agent, such as phenol. However, the latter, and many other similar disinfectants, may be very irritating to sensitive skins, not only in the original dilution but increasingly as further quantities of disinfectant are added to the oil with the hazy idea of rais-

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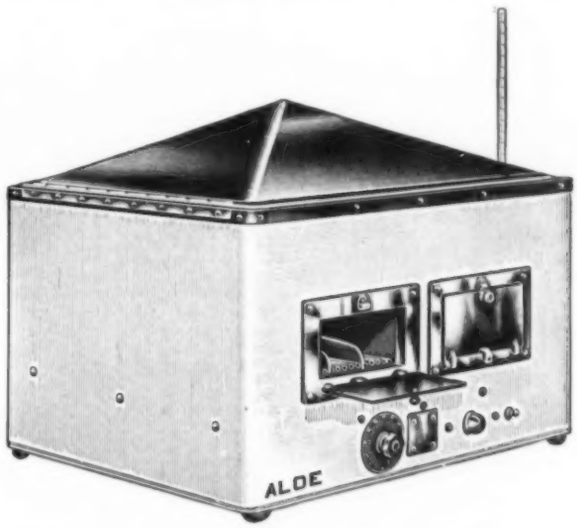
ing the germicidal potency. If the disinfectant proves troublesome, then it is necessary to eliminate this irritant from the oil. Before condemning an oil, therefore, it is advisable to inquire about its possible medication. As a rule, fresh oil is sterile and is not conducive to the growth of organisms."

MARYLAND ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS held its annual meeting at Longfellow Hotel, Baltimore, Friday, April 24, 1942. The meeting was preceded by a dinner, the speaker of the evening was DR. GORDON MACKAY MORRISON, of the Lahey Clinic of Boston, Massachusetts. Dr. Morrison's subject was "Radial Nerve Injuries Accompanying Humeral Fractures," and he went into detail about the different manifestations in nerve injury following trauma. Along with this he showed 1400 ft. of film revealing the operative procedure and each state of the operation for the relief of this injury. Following the film, there was a lively discussion, and DR. MORRISON brought out a number of good points and told of his experiences in many of these operations. Officers were elected as follows: DR. HAROLD R. BOHLMAN, President, DR. EDWARD THOMAS, Frederick, Maryland, Vice-President; DR. R. F. CHENOWITH, Secretary-Treasurer. Eighteen new members were received into the Association; and DR. ROY LOCHER was elected member at large.

OF INTEREST to the furtherance of industrial health knowledge among general practitioners was part of the recent program of the Philadelphia County Medical Society Postgraduate Seminar. The first hour of one morning was devoted to papers on the following topics:

1. "Industrial Health: Scope and Relationships" — CHARLES-FRANCIS LONG, M.D., Chairman, Committee on Industrial Health, Medical Society of the State of Pennsylvania.
2. "Prevention of Lost Time Inside the Factory" — MERVYN ROSS TAYLOR, M.D., Regional Medical Director, Bell Telephone Company of Pennsylvania.
3. "Prevention of Lost Time Outside the Factory"—HOWARD BRICKER, M.D., Chief Medical Officer, Philadelphia Transportation Company.

That same evening was devoted to a round table on the general subject of "You and Industrial Health." It was very well attended and more questions were presented for answer than the time allowed. DR. C. F. LONG acted as the Clifton Fadiman of the round table and his Board of Experts included DR. WILLIAM BATES, President-Elect of the Philadelphia County Medical Society; DR. BRADFORD SCUDDER, Medical Officer, Grasselli Chemical Division, E. I. du Pont de Nemours & Co.; MR. WILLIAM L. DENTLER, Chief Engineer, Philadelphia Office, Bureau of Industrial Hygiene, Pennsylvania Department of Health; DR. GLENN S. EVERTS, Medical Officer for five small Philadelphia industries; and DR. EDWARD W. PANGBURN, general practitioner and Medical Officer for the Precision Grinding Wheel Co.



New Serological Water Baths for the Kahn Verification Test

Provided with Built-in Pipette Compartments

These new serological baths have been specially made according to the author's specifications for use in the Kahn Verification Test. Two types are offered: an electric Warm Bath for use at 37° C. (which may be used for temperatures up to 60° C.) and a Cold Bath for use at 1° C. with ice. The Warm Bath consists of a well-insulated inner chamber measuring 16 x 19 inches, with a perforated inner shelf for accommodating serological tube racks in the usual manner. The shelf rests on two pipette compartments with doors opening on the exterior front of the bath. A precision hydraulic thermostat with an expansion element in conjunction with a positive-acting magnetic switch maintains the temperature within ½° C. No micro switches are necessary for the thermostat employed. The Cold Bath is similar in all respects to the Warm Bath, but has no heating element. In use, cracked ice with water is placed over the removable inner shelf, causing cold water to surround the pipette chambers.

JL4-994—Kahn Verification Serological Water Bath, for 37° C., complete with heating element, thermostat, etc., for 110-120 volts A. C. or D. C. Each.....$140.00

JL4-995—Kahn Verification Test Water Bath for 1° C. Each.. 75.00

Write for complete description of these and other baths.

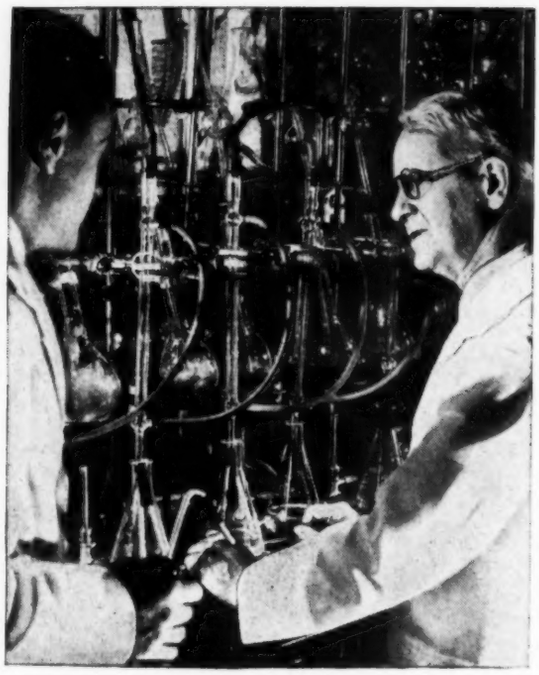
Industrial Division

A. S. ALOE COMPANY

1831 OLIVE STREET • SAINT LOUIS, MISSOURI

BULLETIN from Britain quoted in *Industrial Hygiene*, February, 1942 contains the following: "The need for increased production has, in fact, produced many interesting experiments. The use of music in relieving fatigue and lifting the monotony of work is now widespread. Oddly enough, it is proving most valuable in factories where there is a great deal of noise. It has been found here that the rhythms must be carefully arranged—waltz, foxtrot and march must not follow too closely on each other or the workers are distracted. Some firms give free artificial sunlight treatments—any employee may take a few minutes treatment a day for a prescribed period. Care of the workers, however, does not stop at the factory gates. A regional welfare officer has been appointed to each of the Factory Department's 11 regions, and local welfare officers to areas where the needs of war workers are greatest. Even day nurseries have a part to play in the war production drive, for it was essential, if women were to go into industry,

THE REAL IMPORTANCE IN CIGARETTE



Less nicotine in the smoke of
SLOWER-BURNING CAMELS

than in that of the 4 other largest-selling brands tested—less than any of them—according to independent scientific tests *of the smoke itself!*

—when you are advising patients on the brand of cigarette to smoke

MAJOR scientific opinion agrees on 3 facts about cigarette smoking—

1. Nicotine is the chief component of pharmacologic and physiologic significance in cigarette smoke.

2. Nicotine is important to the smoker ***only in the smoke.***

3. Available medical research* indicates, and Camel's scientific tests on hundreds of samples show (see pictures), that a slower-burning cigarette produces less nicotine *in the smoke.*

Then here is the important question:

CAMEL

THE CIGARETTE OF COSTLIER TOBACCOS

OF LESS NICOTINE SMOKE

Is a reduction of nicotine *in the smoke itself* of real physiologic importance to a regular Camel smoker?

A prominent physician states in an important article** on smoking, that when injections of nicotine were increased by only 25%, profound changes in blood pressure occurred.

The "Pleasure Factor"

In addition to a desirable reduction in nicotine intake, Camel offers another big advantage—a bid for patients' cooperation in a program of smoking modification. Camel is the slower-burning cigarette for more mildness, coolness, flavor!

In the same tests, Camel burned SLOWER than any of the 4 other largest-selling brands tested.

* J. A. M. A., 93:1110—October 12, 1929
Brückner, H—Die Biochemie des Tabaks, 1936
** The Military Surgeon, Vol. 89, No. 1, p. 7, July, 1941

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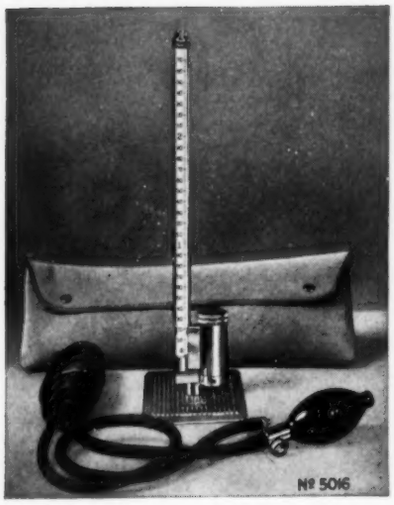

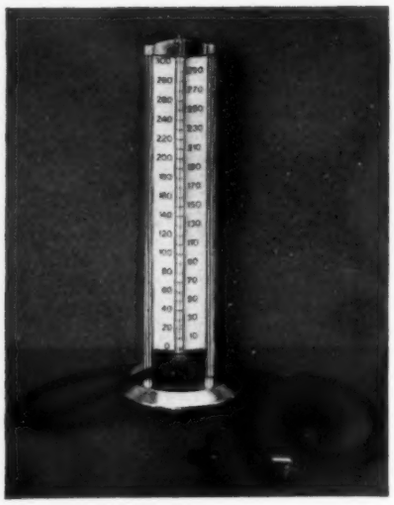

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—*Continued on page 233*

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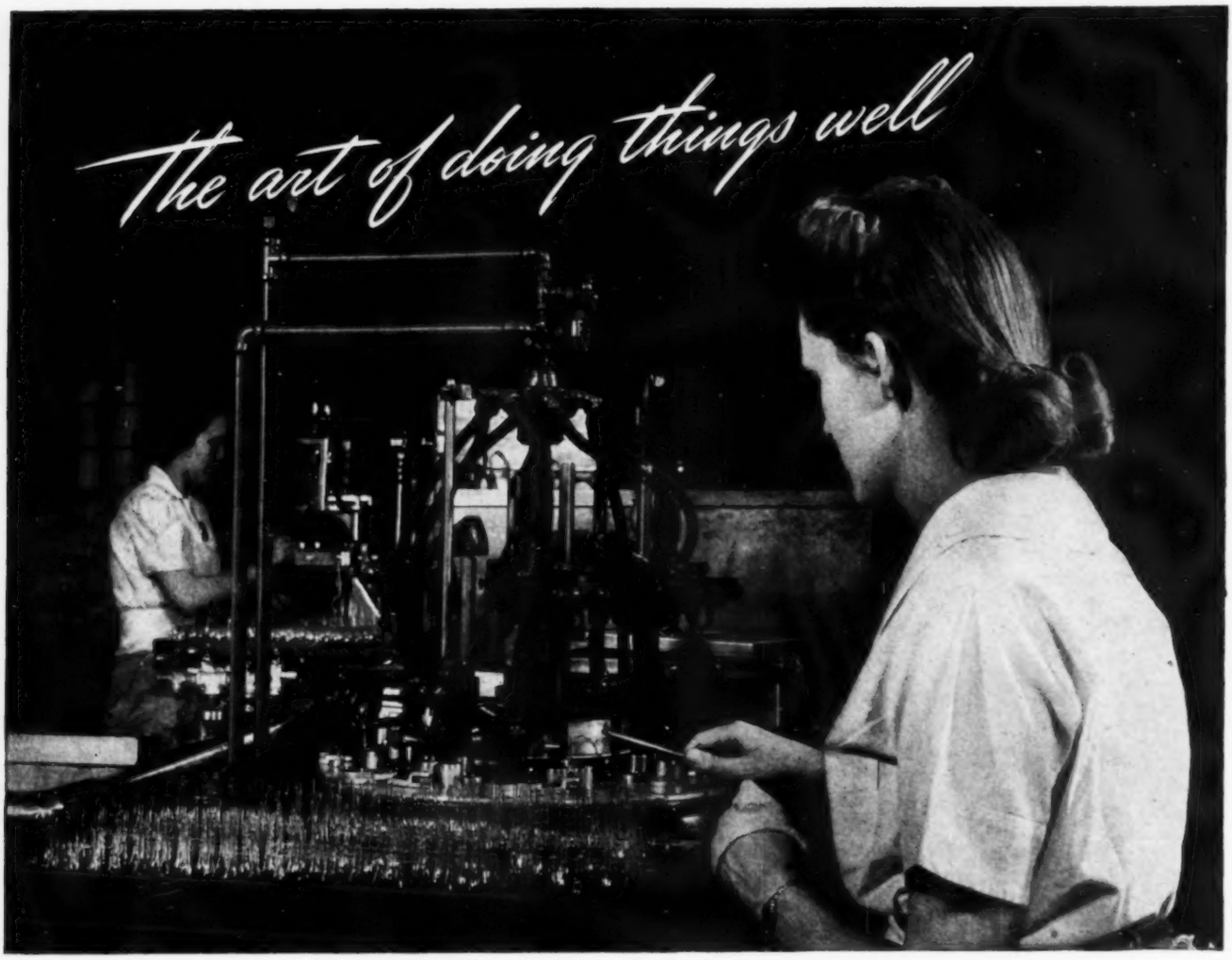

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The Journal of Occupational Diseases and Traumatic Surgery

With which are consolidated "The Industrial Doctor" and "International Journal of Medicine and Surgery."

The Science, the Law and the Economics of Industrial Health

Volume 11 May, 1942 Number 5

Trauma and Other Occupational Factors in Tuberculosis

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Los Angeles, California

ANY disease peculiar to an occupation and not common to other occupations is truly an occupational disease. Tuberculosis, sparing no class, race, or creed, is not an occupational disease but may be an industrial disease if it is shown that its incidence in a particular industry is distinctly higher than among the general population. In California the Workmen's Compensation Act construes any disease as compensable if the medical facts prove a causal relationship between it and either the environment of the worker or an injury arising out of and in the course of employment. Hence tuberculosis activated or aggravated by trauma is compensable. Each case must be decided on its own merits. The criteria on which a decision is based are the nature, severity and character of the trauma, the age and condition of the worker prior to trauma, the elapsed time between the accident and the onset of disease, and continuity of relationship between trauma and its direct and ultimate effect on the worker. The medical evidence *per se* determines only the presence or absence of tuberculosis.

To establish an occupational relationship in tuberculosis, Ornstein[1] holds that symptoms should begin immediately (within 24 to 48 hours from the time of injury). Amberson[2] believes symptoms should be manifest within a few days. It is obvious that symptoms alone cannot justly be the deciding factor.

Since the report of Herodotus of the death of Prince Xerxes, from phthisis following an injury to his chest in a fall from a horse, there have been many similar reports of tuberculosis from trauma. These have been fewer since the bacillary origin of tuberculosis was discovered. Hawes[3] found in a series of 76 claims before the Massachusetts Industrial Board during three years 39 clearly established cases of occupational relationship, and 15 borderline cases. The remainder were regarded as clearly non-industrial either because of previous family exposure (11 cases) or lack of reasonable evidence of aggravating factors in the employment. During the six months after Michigan's Occupational Disease Reporting Act became effective, only three tuberculosis claims were reported and these were not accepted as truly occupational.

The economic importance of tuberculosis in industry is indicated by the per case cost of tuberculosis of $4,062.00 among Eastman Kodak Company employees and by the finding that 50% of the victims of tuberculosis in the British Postal Service never return to work.[5]

Subject matter of a presentation at an Annual Meeting of the Trudeau Society, Los Angeles, California.

Importance of Trauma

PRESENCE of the tubercle bacillus is a *sine qua non* in tuberculosis. However, environmental predisposing factors may be physico-chemical, thermal, mechanical, physiological, or pathological. The death rates (Table I) from respiratory tuberculosis according to economic groups in 1930 offer significant data.[6] The average mortality rate per 100,000 for all occupations is 87.4; for professional groups 28.3; for skilled workers and foremen 74.2; and for unskilled workers 183.1. The higher rate in the latter groups than that in moulders, founders, and casters, with 155.5, who are exposed to dust containing free silica, indicates that there are other more important predisposing factors than dust.

TABLE I

DEATH RATES FROM RESPIRATORY TUBERCULOSIS PER 100,000 GAINFULLY OCCUPIED MALES 15 TO 64 YEARS OF AGE IN SELECTED STATES ACCORDING TO ECONOMIC GROUPS—1930*

Average for	
All Occupations	87.4
Professional group	28.3
Lawyers and judges	21.2
Physicians and surgeons	29.4
Proprietors, managers and officials	44.8
Bankers, brokers, money lenders	22.5
Managers and officials	27.9
Builders and contractors	33.1
Clerks and kindred workers	62.4
Real estate agents	28.8
Agricultural workers	46.7
Skilled workers and foremen	74.2
Moulders, founders and casters	155.5
Policemen	46.0
Unskilled workers	183.1
Factory and building construction laborers	221.7
Servants and cooks	156.0

*Industrial Tuberculosis, H. I. SPECTOR, St. Louis, *J. Missouri State Med. Assoc.*, 35:131, April, 1938.

FREE SILICA: That silicosis favors the development of tuberculosis is demonstrated clinically, pathologically, and experimentally, as pointed out by Gardner.[7] He cites the facts that 75% of the Rand silicotics prior to 1929 died of tuberculosis; that 30% of the Joplin

zinc miners in 1917 had tubercle bacilli in their sputa; that prior to 1924 65% of the Barre granite cutters died of tuberculosis; and that in anthracite coal miners 4.6% with silicosis compared with 2% of non-silicotics had tuberculosis. (But silicosis is outside the scope of this discussion and will be considered in a later paper.)

SILICATES: Among the silicates, excepting asbestos, Gardner[7] has been unable to produce experimental fibrosis within one year in uninfected tissues. He feels, however, that the harmlessness of silicates without infection has not yet been proved. Merewether[8] observed that the silicates in asbestos produce a more rapid fibrosis in humans than in guinea pigs. He reports among eight deaths in asbestos workers six from fibrosis, and two from tuberculosis and fibrosis. His statement that silicates, including asbestos, have not been shown to be associated with an increasing mortality from pulmonary tuberculosis is not conclusive.

"Harmful dusts may activate latent, or exaggerate active, tuberculosis or coincident infection," according to Sayers,[9] who believes that asbestos has not been shown to predispose to tuberculosis as does silica. He says further that the tuberculosis complicating asbestosis is not of a fulminating type. As regards talc, an acid metasilicate of magnesium, he recognizes a fine bilateral fibrosis which has not been reported to cause disability. A case of fibrosis with disability in a talc grinder was seen by me in 1937, but silica from a previous employment as a miner may have been responsible in part. There was no clinical evidence of tuberculosis.

WAR GASES: Gilchrist[10] concludes that pulmonary tuberculosis was not a prominent residuum of the effects of war gases. He found an incidence of tuberculosis of 2.45 per 1,000 among 70,552 men gassed in action. The rate for men not gassed was 3.50 in 1918; 4.30 in 1919. Berghoff,[11] after examining 2,000 gassed soldiers three to four months after exposure, concluded that gas victims regardless of type and severity of gas show no marked predisposition either toward active tuberculosis or reactivation of healed or quiescent lesions. Fifty percent of the group were normal, 30% bronchitic, and 22% had emphysema.

TEMPERATURE CHANGES: Mayer[12] believes the case for thermic shock is not proved. Kessler and Hope have said that excesses of heat and cold do predispose to tuberculosis.[13] Skolnick[13] cites a convincing case of a fireman who, after becoming fatigued, warm and wet while fighting a fire, was chilled by sub-freezing temperatures. Onset the next day of chills, fever, and cough was followed by proved signs of laryngeal and pulmonary tuberculosis. It was felt that thermal trauma had activated latent bacilli and reduced resistance. In this connection the possible effects of modern air conditioning should be considered. I have knowledge of one large business concern which experienced such increase in upper respiratory tract infections among its office employees that it surrendered its lease of air conditioned quarters. Such experience, however, may be due to faulty air conditioning.

OTHER DISEASES: Norris and Grave[13] say acute diseases may increase susceptibility. Shipman[14] describes a stevedore who was wet and chilled from falling into San Francisco Bay. Pneumonia developed next day, there was delayed resolution and later the tubercle bacillus was found in the sputum. The decision of the Industrial Accident Commission was that an industrial accident caused pneumonia which reactivated an old quiescent pulmonary tuberculosis. All of us would agree that acute infections, influenza, pnemonia, etc., clearly prepare the soil for the harvest of tuberculosis by lowering the general body resistance.

PHYSIOLOGICAL STATES: Krause and Hope[13] believe that physiological states such as fatigue, excessive strain and dissipation may lower resistance and permit reactivation of tuberculosis. Shipman's two patients[14] are illustrative of the claim of reactivation by strain. One, a mechanic, during a heavy lift "felt something give way" and had immediate hemoptysis. A roentgenogram the same day revealed a cavity surrounded by soft infiltration. Decision that the case was non-industrial was based on the fact that spontaneous hemorrhage commonly occurs from this type of cavity. The other, a cement worker, suffered stabbing pain in the chest and dyspnea while pushing a heavy wheel-barrow of cement. A few days later a sterile hydropneumothorax was found. Decision that the case was industrial rested on the fact that the workman previously was well.

A less likely case, within my own experience, is that of a saleslady who was struck on the right shoulder by a falling display stand. Beginning two days later recurring hemoptysis set in, finally necessitating blood transfusion. She had had repeated hemoptysis during the previous 12 years and a diagnosis of moderately advanced pulmonary tuberculosis five years prior to her accident. I believed the hemoptysis to have been non-industrial because of the previous spontaneous hemorrhages and the minor nature of her accident.

MECHANICAL TRAUMA: The factor of mechanical trauma, direct or indirect, is an important one. Such trauma may be either extra-thoracic or thoracic. Twenty-five percent of bone and joint tuberculosis is claimed to be due to local injury by Mayer.[12] Such instances are illustrative of the application of Schultz's law that after trauma organisms circulating in the blood tend to localize at a *locus minus resistentiae* (spot of lowered resistance).

It is not so easy to prove that extra-thoracic, local mechanical trauma greatly reduces general defense powers against pulmonary infection.

As regards extra-pulmonary tuberculosis most of us have seen pathologist's and butcher's warts. Bunnell and Boyes[15] saw two cases of tuberculous tensynovitis of the hand in employees of a fertilizer plant where diseased animals were slaughtered. In none was there evidence of tuberculosis elsewhere in the body. A third patient developed tuberculous tenosynovitis of the palm allegedly as the result of trauma. He had a chronic, open, tuberculous lesion of the sacrum. The latter case was held to be non-industrial.

An unusual case of primary tuberculosis of the skin observed by me was in a nurse. She pricked her wrist with a safety pin while attending a patient with open pulmonary tuberculosis. One month later a small lesion of the skin appeared. After another month tubercle bacilli were recovered from a suppurating axillary gland. In California this would be regarded as a compensable case.

SURGICAL TRAUMA: Illustrating instances of surgical trauma in tuberculosis, Mayer[12] refers to primary inoculation of circumcision wounds by tuberculous mohels; to Incze's report of infection of a child's esophagus already damaged from swallowing lye, when a tuberculous attendant passed a bougie; and to Buengeler's citation of a woman who died of tuberculosis after curettage of an unsuspected tuberculous uterus.

TRAUMA TO CHEST: The relation of thoracic trauma to pulmonary tuberculosis is less clear, especially when it is remembered that perhaps 95% of the people have an initial invasion by tubercle bacilli in childhood and that many have reinfection before reaching adult life. Mayer[12] feels that it must be shown that the patient was "never well" since the accident. He also empha-

sizes the obvious fact that occurrence of traumatic hemoptysis does not warrant a diagnosis of traumatic tuberculosis. Most of us would demand that an applied force be violent enough to rupture a poorly walled-off tuberculous lesion in the lung thus permitting either direct extension or hematogenous dissemination of tubercle bacilli. Illustrative is Mayer's case[12] of an elevator operator who, after recovering from a crushing injury to his chest which fractured two ribs, worked for two years and then manifested symptoms of tuberculosis. Roentgenograms demonstrated destruction of almost all of his left and nearly half of his right lung.

Another case in point is that of a baker, 34 years of age, seen by me in 1938. Some breadpans slid off a truck, striking his right shoulder and neck. He was not disabled but after three weeks lost four days on account of a "cold, fever, and diarrhea." Four months later, according to the patient's story, he gradually developed symptoms of tuberculosis and had to quit work eight months after the accident. Hemoptysis of mild degree, which began one month before his disability, continued intermittently for three or four months. The contusion of the chest was the alleged cause of his disability. Investigation revealed that his wife had been under treatment for "incipient tuberculosis" for over a year prior to his beginning disability and that cough, unusual fatigue, weakness, and nervousness actually had been complained of by him two months prior to his accident. I regarded the tuberculosis as non-industrial. It could be argued that the injury to his shoulder had aggravated a then active preexisting tuberculous lesion, especially since roentgenograms revealed residual findings in the right seventh and eight ribs, suggesting old healed fractures. However, the x-rays also disclosed *bilateral* apical tuberculosis although the lesion was more extensive on the side of his injury.

Conclusions

OCCUPATIONAL environments and industrial accidents are factors in the development and reactivation or aggravation of tuberculosis.

2. Each case should be decided on its own merits after considering all essential criteria for establishing an occupational relationship.

3. Decision often is difficult, especially where workmen's compensation is an issue.

4. Pre-employment examinations would aid not only in case finding, but also in prevention of the spread of tuberculosis due to occupational factors.

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Nutritional Fitness Surveys in Industry

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PRECISE estimates of the losses incurred by industry as the result of faulty nutrition are unavailable. It is commonly agreed that such losses do exist and that their sum is huge, greater by far than those incident to occupational accidents.

Many agencies are at work on a program of suggested activities designed to investigate the nature of nutritional faults and how these faults express themselves ultimately in wasted manpower. Certainly the most authoritative suggestion at this time is included in the Report of the Committee on Nutrition in Industry of the National Research Council, whose chairman is Dr. Frank G. Boudreau.[1]

Mention is made, for example, of the work of Schettler, Bisbee and Goodenough[2] who employed the biophotometer to detect avitaminosis A which they found prevalent among color matchers. Prolonged treatment with high vitamin A concentrates effected marked improvement.

Other instances are cited in the report to hint strongly that various nutritional deficiencies are detectable among workers if they are especially sought; but the entire subject is still formative and in a stage of considerable haziness. From the confusion there arises only the conviction that there is a problem of faulty nutrition to be faced in industry; that the problem is of vast importance and timeliness; and that industry must face it at once out of economic and patriotic necessity.

How to Approach the Problem

TO TRAINED personnel managers the desirable method of approach to the problem is easily surmised. The method is no different from that dictated by the same logical judgment that prescribed the approach to the scientific prevention of accidents. This is a three-fold approach, as follows:

1. The creation and the maintenance of interest in health improvement through better nutrition;
2. Fact finding; and
3. Application of corrective measures based on the facts.

Top management realizes the necessity for stressing as the very first principle the creation and maintenance of active interest. Any plan that does not arouse the interest of employer and employee alike, and sustain it, is doomed to failure. In addition, the relations between labor and industry are at this time occasionally strained. Delicate handling is required to initiate a program that attempts to change the dietary traditions of a worker and his family, more especially in the case of descendants of the foreign-born. Under these circumstances, the nutritionist should appreciate that a large number of the foods of the foreign-born peoples are well adapted to their physical needs. Greater progress can be made in such instances by restoring dietary balance through supplying the loss of missing elements than by attempting to introduce an American concept of a complete and balanced diet totally strange to the customs of the worker.

With interest developed to a high pitch, it is comparatively easy to gather the facts upon which to predicate corrective measures. Without these facts, the initiation of any corrective program is entirely premature. An example is the present rush to

distribute, indiscriminately, empirically-compounded commercially-expedient vitamin concentrate "pills." That such distribution is empiric and reflects commercial expediency is revealed by the constantly changing formulas in which certain vitamins are increased in amounts, decreased, introduced or removed, all according to the ease with which they can or cannot be procured. Clearly, such practice casts something of a suspicion on the medical and nutritional soundness of the prescribing physician's understanding of what he is doing.

Where Should Interest Begin?

FAULTY nutrition is by no means confined to the worker in the plant or in the office. It prevails fully as much among middle and top executives. Surely, the conservation of executive manpower is as important economically as is the conservation and uplift of worker manpower. There is, therefore, good reason for beginning a nutritional study in a plant with the executives instead of with the plant workers.

Emerson's brilliant contributions on the physical fitness surveys of executives make splendid precedents for the manner of starting nutritional fitness surveys.[3, 4, 5]

Here is a synopsis of our own procedure. It is tentative, but it will suffice until a better one is elaborated.

First. Prepare a nutritional history chart. Excellent examples are to be found in the works of Stern,[6] Chaney and Ahlborn,[7] and Hawley and Maurer-Mast.[8]

Second. Prepare forms on which the volunteer keeps a daily record for at least a week, holidays included, of the intake of each and every article of diet or beverage consumed during the week.

Third. Install a bio-photometer or its equivalent in a room especially provided by the company to serve as headquarters for the nutritional clinic where the nutritionist, and his assistant if one is needed, is stationed conveniently within reach of the office workers and executives in whose department the work is to be carried on.

Fourth. Install an accurate scale and a device for measuring height.

When these facilities have been provided and suitably arranged, the top executive in whose department the investigation is to be made sends around a friendly invitation to all the members of the department briefly outlining the importance that good health, as influenced by nutrition, plays in the present emergency; and that because of that importance, an outside authority on nutrition has been invited to give a short talk to all those who wish to attend. Attendance is purely voluntary.

Following the presentation by the invited nutritional authority, the members of the department then receive a second notice indicating that a private and confidential nutritional fitness service will be made available for anyone in the department that wishes to profit by the simple and entirely impersonal questioning and equally simple and interesting "vitamin x-raying tests" (referring to the bio-photometer light adaptation measurements). it is usually possible to locate in advance some conspicuous member of the department who is subject to night-blindness; tests are made, corrective measures through diet reformulation prescribed, and the improvement recorded. These individuals are to be found in any office, even among the executives. Such an experience is an object lesson in demonstrating the practical application of survey principles in locating and correcting dietary deficiencies and thus leads to active interest on the part of other employees.

Usually, the program starts with active interest which is not only sustained but also intensifies as person after person is aided by the simple dietary recommendations that the nutritional history, the food intake analysis, weighing, the measuring of height, and the bio-photometer test suggest. As an important by-product of the interest, innumerable bad eating habits are corrected which reflect with incredible rapidity on the records of the personnel manager. These reflections touch the exasperating problems of tardiness, absenteeism, respiratory tract illnesses, fatigue, the incidence of accidents, and the jittery morale precipitated by the tenseness of wartime "nerves." Last, but most important, the nutritional fitness survey inculcates the important advantages to be derived from "nutrition consciousness" which is deeply implanted in the minds of its beneficiaries. Food faddisms and expensive synthetic vitamin orgies decline, and the mind is made receptive to additional counsel on nutrition which is then effectively presented through the usual educational avenues—bulletin board announcements, posters, pamphlets, "payrollograms," lectures, visiting dieticians, and other means. To indulge in an educational campaign through these avenues without first preparing for its acceptable reception by those for whom it is intended has repeatedly proved unsuccessful.

What Nutritional Fitness Surveys Reveal

LIKE physical fitness surveys, nutritional fitness surveys disclose a high incidence of faulty food habits among executives and office workers. Fast eating, washing food down with sweetened carbonated beverages, overeating, undereating, filling up on candies and sweets between meals, excessive tea or coffee, finicky food traits, and a great preponderance of strikingly unbalanced food assortment are some of the findings in any group examined. There can be no question about the need for correcting the food habits of the vast majority of the people. All indications, in industry and out, confirm this view.

To be sure, such nutritional fitness surveys are so far too few to permit of any sweeping generalization as to the most needed corrective measure; but they are not too few to indicate clearly that:

1. Each group of industrial workers, even in the same industry but assigned to different duties, requires special handling;

2. The most prevalent problem so far met is the need for developing an interest in nutrition to make nutritional education effective;

3. There are isolated instances where occupational surveys disclose a specific vitamin deficiency, as in the Westinghouse color matchers; but in general, the vitamin deficiencies so far encountered are evidences of bad food selection and are accompanied by other defects not amenable to vitamin therapy alone.

It is apparent that management quickly senses the import of nutritional fitness surveying as a prelude to solving the problem of the nutrition of the industrial worker. No evidence is more impelling than that which focuses directly upon the managerial personnel itself; so that an important accomplishment of the nutritional fitness survey is the double achievement in one maneuver of:

1. Revealing and correcting efficiency-robbing food habits in top management personnel which are profitably corrected; and

2. Developing confidence in the scientific justification of definite nutritional procedures which lend themselves to accurate measurement in terms of increased production.

Essentially, nutritional fitness surveys are excellently suited to prove that there is a nutrition problem in industry; that it affects all workers, managerial and otherwise; that it is scientifically approachable; and that it lends itself to definite measurement in terms for which the program is intended—the improvement in health and production by the adjustment of the human machine through proper fueling.

As quickly as top management has experienced the practicability of nutritional fitness surveying, and has seen the possibility of rapidly applying the corrective measures which the survey suggests, the same plan is applied to the supervisors or foremen. This enlists their immediate support. When the supervisors are completely aware of the simplicity of the work and the advantages and benefits that it obviously portends, it is not difficult to take the final step—the application of the program to the workers in the plant.

These are the steps recognized by management as an insurance to the successful introduction of any campaign in a plant.

The Industrial Physician

IT IS a paradox, understandable, that the industrial physician who is entrusted generally with the physical fitness and health education of the workers may often neglect the nutritional aspect of the situation. If this were not true, the prevalence of nutritional disorders among workers would not be so widespread.

Nutrition is a highly specialized biochemical science. As the Furnases point out, no American medical college prescribes a course on nutrition as a prerequisite for the degree of Doctor of Medicine.[9] This does not mean that many physicians have neglected the serious study of nutrition and have failed to reach eminent heights in this field; but the training of the industrial physician is usually along surgical lines which, because of its specialization, essentially precludes any opportunity of surrendering much or any of the time necessary in mastering surgical skill, to the study and tedium of nutritional training. In plain fact, contact with numerous industrial physicians of unquestioned proficiency reveals that most are conspicuously lacking in any scientifically organized knowledge of nutrition and dietetics. Besides, plant physicians at this time are in most instances overworked.

There will be need, obviously, to usher into this phase of industrial medicine the aid of competently trained nutritionists to work in collaboration with the physician. The perplexing academic question is whether nutritional deficiency is the result of some underlying condition or disease (medical), or whether disease is the outcome of faulty eating (nutritional). Hence the necessity for team-work. Management insists upon the remedying of the handicap and is not concerned with splitting hairs about assigning its origin to the domain of medicine or nutrition. It belongs properly in the domain of better health, to which everyone can contribute. Management wants and it is entitled to results.

Summary

IT CAN be agreed that the next significant advance in industry is the improvement of the health of the worker through better nutrition.

Every indication suggests that the advance can outdo in economic advantages the tested and proved values derived from scientific accident prevention.

The first requirement for the intelligent initiation of corrective measures is fact finding. It is impossible to prescribe a cure if the nature of the disease is not identified.

But fact finding must be correlated with the creation and the maintenance of active interest, as was experienced in the scientific solution of accident prevention.

There is presented a logical approach which uniquely combines the creation of interest with fact finding in the form of a nutritional fitness survey. Some of the details are described.

The suggested procedure is inexpensive to conduct; it yields immediate facts; it provides instant benefits; it stimulates intense interest. It is everywhere consonant with scientific method, and it respects the troublesome problems of personnel management.

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Hospital Management of Industrial Cases

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GOLDEN TEXT—The practice of industrial medicine and surgery differs in no essential manner from the practice of medicine and surgery among private patients. The patient wants the best possible result in the shortest possible time at the least possible cost; industry can ask no more.

If industrial practice differs in no essential manner, it nevertheless differs in minor ways which should be appreciated and taken advantage of by those who practice in this field. The most logical divisions of medicine and surgery into specialties are anatomical divisions, as, the eye, the ear, nose and throat, the vascular system, the genito-urinary system, the female organs, the chest, the abdomen, the brain and nervous system, and the bones and joints. Some specialties are defined by limitations of age rather than anatomy, as pediatrics and geriatrics. Pathology and roentgenology are defined by the special methods which they employ. Traumatic surgery covers every part, organ and function of the body, presumably only to the extent to which every part may be affected by trauma.

Industrial practice embraces in a special way the whole field of traumatic surgery plus occupational disease, but touches the entire range of the healing arts. Its methods of diagnosis and treatment, medical and surgical, distinguish it in no way. Its differences are economic and social, rather than strictly professional. Industrial practice arose in certain industries as a means of rendering necessary medical and surgical services to employee groups, either because these services were not otherwise available, or to provide them at reduced costs. Both objectives were legitimate and honorable, and are still being well served. But the industrial physician may well remind himself frequently that his existence is justified only as he provides a standard of medical service better than would

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otherwise be available to his patients at a cost which would otherwise be impossible.

Any differences between the hospital management of industrial cases and of other cases must follow the same general lines. Methods of diagnosis and types of treatment indicated are the same. Any justifiable difference must be on a social or economic basis.

A useful approach to this subject is a classification of the types of industrial cases which demand hospitalization, with some consideration of the particular indications which obtain because they are industrial cases.

Types of Industrial Cases to be Hospitalized

HEAD INJURIES: The workman who was rendered immediately unconscious by an accident, and remained unconscious long enough for an ambulance to arrive, has always been hospitalized. If he did not bleed from the ears or nose, if his pupils were equal, and if the x-rays available did not show a fracture line, he was often allowed to go home too soon. If he woke up before the ambulance came he sometimes went directly home, to die of meningeal hemorrhage. Whether he ever got to the hospital or not he occasionally suffered disability, insanity or death from subdural hematoma, the first signs of which appeared days or weeks after his injury. He frequently suffered chronic headaches, emotional instability, or minor character changes as a result of simple concussion or intracerebral hemorrhage, all of which might have been prevented by an adequate period of bed rest immediately following his injury. A safe rule for the treatment of every head injury in which the patient has been rendered unconscious for any period of time whatever is to enforce bed rest on that patient for one week following the disappearance of every symptom and sign of intracranial injury. The economic considerations in industrial injuries make this rule more, rather than less, sound.

All rules are, of course, subject to intelligent exceptions. Some patients would fret themselves into neuroses if confined strictly to bed for one symptom-free week; others would simply refuse to stay there. Any modification downward, however, should imply a more than usually careful observation of the patient for several days. Whether the less serious injuries may be treated outside of a hospital depends upon the character of the patient and on the nature of his home surroundings. If the patient is undependable or if his home environment is unsatisfactory, he belongs in a hospital.

BACK INJURIES: No greater diagnostic problems in differentiating the effects of trauma arise in any part of the body than in interpreting symptoms referred to the back. The legal interpretation of "trauma" to include "unusual effort," and the universal acceptance of the "aggravation" theory in workmen's compensation, make such problems more difficult. Industrial surgeons, plagued by a series of such cases, say in exasperation, "Let's hospitalize every workman who complains of a back injury and keep him flat on a fracture bed for two weeks whether he needs it or not." Such a course might be profitable to industry. It cannot be practiced as an invariable rule, for one reason because patients will not submit to it. Yet we all know that the secret of success in treating a back "strain" is to relieve all symptoms at an early date. Prolonged pain leads to prolonged muscle spasm, which causes muscular and fascial adhesions and fixed deformity. As in treating any sprain, success lies in preventing respraining. The alert industrial surgeon must consider hospitalization in planning the treatment of any acute back injury. And he must reconsider it before wasting too many weeks of "light work," adhesive strapping, or increasing his equity in a $500.00 inductotherm. Here again the industrial physician must evaluate carefully both the patient and his environment in deciding whether hospitalization is indicated.

SEVERE INFECTIONS: The days of sending these patients out with a massive dressing and a can of Epsom salts, with directions to soak the dirty bandage in salt solution three times a day and come back Tuesday, are, fortunately, over. Most severe infections are now hospitalized. The use of the new sulphonamide drugs does not alter this situation. All of them, if given in adequate doses, may produce reactions, which can be watched for only under hospital supervision.

The most important treatment of infection is still rest. Local infection demands local rest. Hugh Owen Thomas preached it in 1875, insisting that it be "enforced, uninterrupted and prolonged." Sumner Koch and many others preach it today as "purposeful splinting." Yet how few doctors practice it! The introduction of the sulphonamides seems likely to throw the splinting of infections back into still further neglect. Its widespread adoption by industrial surgeons would be the handiest possible demonstration of their professional competence before their doubting colleagues. General infection, or local infection with general intoxication, demands general rest; and that, in most instances, requires hospitalization.

FRACTURES: Many acute fractures and dislocations can be reduced best outside any hospital. We have a period of grace lasting from 10 to 30 minutes in which a displacement of an extremity may be grasped in two competent hands and reduced, while the immediate shock provides sufficient anesthesia, before the available tissue spaces are filled with hematoma, before muscle spasm occurs, and before real shock sets in. Such simple fractures and dislocations must be checked by x-ray, and perhaps permanently splinted, at either an office or a hospital. All major, and many minor, fractures are best treated at a hospital. The foresighted surgeon will frequently give an anesthetic for a closed reduction of a fracture or dislocation only after setting up all the armamentarium to proceed with an open reduction if manipulation alone fails. Even here time is of the essence; fractures and dislocations are emergencies.

TENDON AND NERVE INJURIES: Injuries to tendons and to peripheral nerves are surgical emergencies of even more demanding nature than fractures. The period of grace during which a wound may be contaminated but not infected, during which primary repair may succeed, is reckoned in hours. They belong in hospitals rather than in offices only because of the necessity of attempting every repair under the very best aseptic conditions available.

DIAGNOSTIC PROBLEMS: A substantial part of every industrial practice is spent in differentiating the effects of accidental injury and occupational disease from the ordinary ills of life. The industrial physician must frequently hospitalize these cases for x-ray studies, laboratory procedures, and consultations with specialists, all paid for by industry, as a means of establishing either a basis for treatment or a medical defence which will stand up in court. Incidentally, this necessity on the part of the employer frequently puts the industrial physician in a position to render a grade of medical service to a worker that is not available to the worker's private physician because of its cost.

THE HOMELESS AND FRIENDLESS: Many industrial cases must be hospitalized for injuries or occupational diseases who could ordinarily be treated as office patients if they had adequate homes. A man with a back injury cannot stay in bed at home if he lives in a flop-

house and eats at quick lunches. A patient in a shoulder spica cannot leave the hospital unless he has someone to help him dress himself. A patient with even a minor infection cannot be discharged to a filthy environment. And a debilitated patient cannot be sent to convalesce in a home accustomed to dietary deficiencies. In truth, the industrial physician is forced by economic necessity to be quite as considerate of the personal relationships of his patient as is any family physician.

THE problem of the hospital management of industrial cases may be further pursued to some profit by a discussion of, first, what industry may reasonably expect of the hospital, and then what the hospital may reasonably expect of industry.

What Industry May Expect of the Hospital

LARGE units of industry sometimes find it practicable to operate special hospitals for the care of their employees. Industrial enterprises operating in isolated regions, such as mining, lumbering, and the construction of dams or fortifications, may have to set up complete hospitals sufficient for all of the needs of their communities. General hospitals in urban centers may be supported in part by corporation funds for the care of occupational accidents and diseases, and in part by employee groups for the care of the non-occupational disabilities of the employees and their families. Many large industries set up emergency hospitals within their gates, but depend on nearby general hospitals for the care of all major cases of either accident or disease. The present discussion may be limited to the general community hospital which derives only a part of its census and revenue from industrial cases. The cases under discussion may be limited to those employees suffering from accidental injury or occupational disease, carried or insured by the employer under the state laws for workmen's compensation, and for whose hospital care the employer is usually liable. The liabilities imposed on the employer with regard to medical care still vary widely under different acts, but most states now hold him liable for necessary hospital care without limitation as to time or expense. What, then, can industry reasonably expect of a general hospital accepting patients under these terms?

GENERAL FACILITIES: In general, of course, the hospital may be expected to provide first rate care, facilities and equipment, just as the industrial physician is expected to provide first rate professional care. All kinds, classes, and conditions of persons work in industry; the hospital, therefore, should have facilities for the housing of adult patients of both sexes, without restriction on account of "race, color or previous condition of servitude." Every part and organ of the body is subject to accidental injury and occupational disease; the hospital, therefore, should have the equipment and the personnel necessary to cover the entire field of medicine and surgery. Its staff should embrace competent specialists in every major field. The problems of differential diagnosis, which so frequently become of legal importance, require complete laboratory service and a good pathologist. The primary objective in the treatment of industrial cases is the restoration of function; the well-equipped hospital should therefore have the equipment and personnel required for good physical therapy and occupational therapy.

ROUTINE SERVICES AND RECORDS: Every patient admitted to any hospital should have a complete history, physical examination, and routine laboratory examination of the blood and urine. The results should be set down in a permanent record readily available in some kind of hospital record library. These routine services are included in the minimum standards set up for hospitals by both the American College of Surgeons and the American Medical Association. The available hospital record on all too many industrial cases is incomplete. Complete examinations and complete records are as essential to the physical welfare of the industrial patient as they are to any other patient; they are even more likely to become of legal importance. Industry may expect a hospital to provide enough interns and clerks, and to exercise enough supervision over them, to insure an adequate permanent hospital record.

EMERGENCIES: Industrial cases impose some special requirements on hospitals because so many of them are accidental injuries requiring emergency care. There is comparatively little elective surgery in industrial practice. The time to reduce a fracture is "right now," which means that x-ray service and fracture equipment must be available at any hour of the day or night. Compound fractures must be debrided at once, in the main operating room and not in the receiving room. The repair of severed tendons and nerves cannot be posted for a convenient hour the following day; it must be done under complete "operating room" conditions within a few hours of the injury. Traumatic injuries to soft parts or viscera often demand immediate surgery. Any hospital which agrees to accept industrial cases should be organized so as to have adequate facilities, equipment, and personnel available for any emergency at any time.

COSTS: The law covering the medical care of industrial cases is called Workmen's Compensation, not Doctors' Compensation, nor Hospitals' Compensation. The blame for industrial injury and disease is laid upon industry as a mode of life. The cost is figured into the finished price of the product of industry, along with other production costs, including wages. Its premiums and its benefits are based on wages. In its universal application it has come to cover white collar workers and some executives, but its principal coverage is still on workmen of low income who would not otherwise be able to survive an economic emergency. There is sound social basis for attempting to minimize the cost of adequate hospital care for industrial cases.

Whatever the actual cost is in a well regulated hospital, the industrial case should be self sustaining. It is manifestly unfair to use funds derived from tax grants or charitable donations to defray part of the cost of industrial cases. The published minimum ward rates in most institutions are insufficient to cover the cost of maintaining a ward patient. Most hospitals try to set minimum rates within the reach of the poor but independent citizens of their communities, with full knowledge that a part of the cost of such patients is coming from endowment or tax income. Other institutions may be forced to extend similar rates by sheer competition. Hospitals maintained by churches and religious orders may offer particularly low rates by utilizing existing buildings and equipment, by using personnel for whom they provide only maintenance, and by freedom from taxation. It may be seriously doubted whether the founders of such institutions ever envisioned them filled with industrial cases attracted there by cheap rates offered to industry.

A fair maintenance cost per day for industrial cases is difficult to arrive at even in a sound, well-managed general hospital. The average "cost per patient per day" which appears in a hospital's annual report is not fair; because it covers all the excess cost of maintaining the rich private patient, and all the past errors in design, financing, and management of the institution. Many of our general hospitals were built in the "roaring '20s," at high construction costs, with

money obtained by assuming a large bonded indebtedness at high interest rates. Industry is not particularly interested in paying off someone else's 15 year old mortgage. Most of our buildings were designed primarily for the convenience of the patient willing to pay from $7.00 to $15.00 per day for his room and board, with a few large and small wards added as necessary evils. The needs of the minimum pay patient can be administered to more economically in a building designed primarily for his care. The demand for minimum rate hospital beds has increased enormously with the recent expansion of hospital insurance, usually sold to groups of persons of moderate means. Many former private rooms of generous dimensions are now being used as two or three bed wards. An entire physical plant designed primarily for this class of patient should certainly effect real conveniences, some reduction in personnel, and an over-all reduction in the base cost per patient per day.

LEGAL ENTANGLEMENTS: Industry may reasonably expect hospital management and personnel to confine themselves to the medical and surgical care of the industrial patient. The legal relationships of the patient whose disability is touched upon by various liability laws may be more complex, and the hospital's moral and ethical obligations more obscure. There are many excuses, most of them bad, for hospital management acting as "capper, drummer, runner" for either personal injury lawyers, sometimes called "ambulance chasers," or for insurance company adjusters. But in industrial cases, covered by workmen's compensation, the hospital may be expected to abstain from any interference with a set of well-established contractual relationships and legal obligations.

What the Hospital May Expect of Industry

COMPETENT PROFESSIONAL CARE OF PATIENTS: It is the duty of the organized staff of a hospital to supervise the standards of practice within its walls. In all of those states in which the right of assignment of medical care is vested in the employer, the hospital may reasonably expect industry, through its chosen physicians and surgeons, to maintain high standards of practice. The most defensible reason for vesting this right of assignment in the employer rests on the assumption that he is more competent, because of his experience and with the aid of his medical department, to select adequate medical care than is the individual workman. A fair insight into the methods by which any employer or insurance company is choosing its physicians may be gained by observing the class of hospital in which these men practice. The doctor who is selected because of his low fee schedule, or because of some family relationship, or for the elegance of his cocktail parties, is unlikely to be on the staffs of the better hospitals. A hospital has a right to see that its industrial cases are given competent professional care.

Industrial physicians are notoriously reluctant to avail themselves of consultations and referrals, ostensibly because of the added cost to the employer. Yet the problems in diagnosis and treatment likely to arise cover so nearly the whole field of medicine and surgery that no practitioner, however old or however experienced, can possibly pretend a high degree of skill in every industrial case. Perhaps industry needs some education in the cash value of specialists. If so, such enlightenment can be provided by the industrial physician easily enough, if he is not deterred by some false pride or inner sense of incompetence. If a hospital has gathered itself a competent staff of consultants it has a right to expect these men to be used in a reasonable number of industrial cases. Likewise it should expect its special laboratory tests and its special treatment methods to be used with a frequency approaching that in its non-industrial patients.

Finally, the hospital may expect any choice of treatment to be made on the basis of the patient's need and without consideration of the cost to industry. As one example, amputations performed to save treatment costs or reduce temporary disabilities cannot be tolerated.

FAIR BUSINESS DEALING: Much of the bad feeling held by hospitals toward insurance companies may be laid to ignorance. Hospitals have needed a lot of education regarding the legal obligations present in different forms of insurance. They have learned a good deal the hard way. A hospital is, after all, an institution of healing, not a law firm. But having taken every precaution possible within its knowledge of the law and of the circumstances surrounding a particular case, a hospital should not be subjected to sharp practices on the part of employers or insurance companies. After weeks or months of valiant service a hospital should not find that the patient's case has been settled without provision for payment of its just bill. After being assured at the start of an employer's responsibility for a long course of treatment, a hospital should not at the end receive a letter offering some compromise settlement of its bill, with check enclosed.

ADEQUATE COMPENSATION: The difficulties of arriving at a fair minimum daily rate have already been touched upon. Hospitals frequently have further difficulty in securing adequate compensation for special services over and above such rates. The arrival of an accident case at the ambulance entrance of any well ordered hospital sets in motion a whole wave of activity, a wave which spreads from floor to floor, involving interns, nurses, laboratory technicians, through the drug and supply departments to the gas and electric bills. Much of this initial cost is never accounted for except as it comes out of an accumulated bill at daily rates. It is lost forever if the patient is arbitrarily moved to another hospital on the following day for no better reason than the convenience of a favored industrial surgeon, or to take advantage of an especially low weekly rate at another hospital.

Another abuse is the failure of those responsible for industrial cases to provide rooms and special nurses for patients requiring special care. Almost any patient can receive necessary medical care in the middle of a large ward, but it is an injustice to other patients and an imposition on the hospital personnel if he is kept there when he is desperately ill. Hospitals should expect some latitude in the interpretation of the term "necessary medical care."

PROMPT PAYMENT: For the ordinary private patient most hospitals exact some cash deposit on admission and expect weekly payment of all bills as accrued. For industrial cases, however, it is almost universal practice to postpone any payment until after, and sometimes long after, the patient is discharged. It is true that hospitals are forced to keep after individual patients to avoid the accumulation of bad debts, and true that corporations are likely to be better credit risks than are individuals. Insurance companies talk of the expense of writing and clearing every draft. Nevertheless hospitals would frequently like interim payments from employers and insurance companies on prolonged cases, for at least two reasons. Interval payments establish the fact of responsibility for the bill, as well as the terms at which it will be acceptable, and insure against any attempt to "chisel" or compromise the final totals. Second, hospitals need money day by day. Few of them are clear of debt. Some of them must pay taxes. Many are behind in their current bills. All of them must meet payrolls and public utility charges

promptly. Payment of their bills for services as accrued would help the hospitals tremendously and would work no great hardship on industry. The frequency with which such payment should be expected would depend on the chronicity of the case and on the past relationships of the hospital and the corporation involved. Between established clients the ordinary surgical case running two or three weeks could probably be handled by one final draft, promptly paid. But in cases where one party does not know the other, a request for weekly payments should not be regarded as outrageous. Even among old friends payments on chronic cases could probably be managed at monthly intervals, if requested by the hospital.

Discussion

EDWARD C. HOLMBLAD, M.D. (Chicago): Dr. Rogers has been frank in his statements, and it is admirable to have him talk "straight from the shoulder." It is desirable that the man responsible for the case should take the responsibility. I think we have come to realize that a compound fracture of the leg occurring at 2:00 in the morning warrants the attending man's immediate attention, and should not be simply piled in bed with an ice-bag or a shot of morphine to wait until it is convenient for him to get around in the morning. The patient is entitled to a first-class attending man's attention at all times. Just today I saw a man who had an injury on Saturday morning at 6:45 and was first seen by the attending man on Monday afternoon.

Some other factors that modify the hospitalization of patients were touched on by Dr. Rogers. Care of the individual who is inclined to be alcoholic, or whose head conditions do not permit him to remain alone without fear of injury, is an important factor. Allowances should be made for the conditions of individuals as to whether they need hospitalization early or can be taken care of at home. If you send one home with a potential anxiety neurosis, you are laying the foundation for a lot of trouble. If you give that patient extra care you may avoid the neurosis, which is so difficult to handle. It is a good principle that if a patient is sick enough to be in a hospital, he is sick enough to be seen on Sundays and holidays—he is sick enough to receive a call from the attending man, or at least one of his assistants.

I was glad to hear Dr. Rogers mention that the other fellow's patient is entitled to some consideration. I don't like the idea of a large ward with a fellow seriously ill in it who requires much attention. A head injury, or other extensive injury, where the nurse has to be running in and out and there are transfusions, etc., is not very pleasant in a big ward. Isn't it only fair to consider the other patients in that ward? No insurance company is going to stand in the way of your requesting that such a patient be put into a semi-private room. If patients are sick enough to require that kind of attention, they certainly deserve accommodations consistent with their degree of illness.

Industrial medicine and surgery, as it relates to hospital practice, should be made a desirable practice. I mean by that that when industrial medicine and surgery is properly done there should be no credit loss. It should be desirable work, and it should be paid work, and when we eliminate some of the rough spots and the bills are settled monthly, I believe hospitals will recognize that it is a desirable type of business and worthy of care. Being responsible for our patients, we have a perfect right to insist that industrial patients get first class service. I heard a statement by a prominent industrialist the other day during a conversation in which it was being planned to give up a certain hospital. He said, "Why don't some of you industrial men get together and make this an industrial hospital, just for industrial patients? It'll be good enough for them." That burned me up. Industrial patients are entitled to the best. They are not entitled only to what is left over. Don't feel that you can get by with it very long, because insurance companies or employers won't be treating their patients. It will be unions, and other individuals. Don't try to palm off inferior service on patients who are entitled to hospital accommodations consistent with their earning capacity. I think that a man who is of a certain social status is entitled to exactly the same accommodations as would be consistent with what he would get if he were paying for an injury that was incurred at home.

Nitric Oxide Fumes

—Treatment after their Inhalation—

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WITH the increased industrial use of nitrates and nitric acid, the industrial surgeon is going to have more cases of illness from the inhalation of nitrogen dioxide. Below —10°C, nitrogen dioxide is a white crystalline solid. Between this temperature and 21.64° it is a liquid; nearly colorless at —9°C, yellow at 0°; and at 21.64° it is orange, becoming nearly black as the temperature rises. The gas does not support combustion of ordinary fuels and is poisonous when inhaled. With an aqueous solution of a fixed alkali, a nitrate and nitrite are formed:

$$2NO_2 - 2KOH = KNO_2 - KNO_3 - H_2O$$

In whatever molecular form the dioxide is inhaled, it is at once altered to that corresponding to body temperature. At 40°C, approximately 30% of the dioxide is in the form of NO_2, and 70% is N_2O_4. It is in this proportion that the gases act upon the respiratory tract. Nitrogen dioxide in the form of N_2O_4 reacts with water to produce nitric and nitrous acid:

$$N_2O_4 - H_2O = HNO_3 - HNO_2$$

The dioxide in the form of NO_2 reacts with water and oxygen from the air to produce nitric acid and nitric oxide:

$$3NO_2 - H_2O = HNO_3 - NO$$

The decomposition of 1 mg. of nitrogen peroxide reaching the respiratory tract yields 0.55 mg. of nitrous acid and 0.98 mg. of nitric acid. As mentioned above, in the presence of an alkali neutralization results in the formation of nitrites and nitrates, chiefly the sodium salts when inhaled. The nitrates when absorbed into the blood stream in the small amounts such as result from the gas, have no particular effect, but the nitrites when absorbed, show definite reaction. For each milligram of the dioxide acting upon the respiratory tract, 0.75 mg. of sodium nitrate is formed. If 39 parts per million of nitrogen dioxide were inhaled during one hour, it would result in the absorption of approximately 20 mg. of sodium nitrite. This would have the same effect as sodium nitrite when swallowed. In large amounts, the nitrite changes hemoglobin to methemoglobin. Men frequently exposed to low concentrations of nitric fumes acquire a tolerance to sodium nitrite which prevents symptoms following its absorption. The first effect of the gas may be only that of bronchial irritation. Later the patient may complain of dizziness, headache, and extreme weakness. Several hours after exposure, difficulty in breathing is noted, and the patient is drowned in his own secretions. The lungs become markedly edematous, death may occur within 24 hours or be delayed for several days.

Because of its insidious action in that it does not cause distressing symptoms at first, it is necessary that anyone who has inhaled a considerable amount of this gas should be removed at once to a hospital for immediate treatment. Tunnel workers can drive their cars home and in 24 hours become gravely ill from the effects of its inhalation.

Occasionally, the effect of this gas may be delayed for a week or more.

A young chemist, in making oxalic acid had an accident and exposed himself to a considerable quantity of nitrogen dioxide. In 12 hours, he became seriously ill and was removed to a hospital, where a diagnosis of pneumonia was made. His condition grew steadily worse for a week, after which time he was given the treatment described below. Upon recovery, 12 days after the onset of his illness, the patient's father, who had been only mildly exposed to the fumes, came down suddenly with an illness which would have been diagnosed as a bronchopneumonia if it had not been for the history of his exposure to nitric oxide fumes.

Fumes from nitric acid coming in contact with organic matter produce an abundance of nitrogen dioxide. Men in industrial plants and firemen are in danger of exposure to these fumes at any time when a carboy of nitric acid breaks.

Treatment

WHEN the patient is first seen, he should be given inhalations of oxygen introduced by means of two catheters placed in the nostrils. If the patient is very restless it may be necessary to strap his hands to prevent his pulling the tubes from the nose. When the lungs are highly edematous as is noted in those brought into the hospital after 24 hours of exposure, an ampoule of salyrgan and 100 cc. of a 50% glucose solution should be given intravenously. The salyrgan injection can be repeated in six hours if there is no improvement. After the first 12 hours, the catheters can be removed and the patient given inhalations of oxygen by the tent method. This method of treatment will relieve the most desperate cases of illness even if administered several days after inhalation of the gas. X-ray pictures of an individual suffering from nitric oxide poisoning will show a condition similar to a bronchopneumonia. The pulse may be as high as 150, the temperature 106 and the respiration 30, with the white blood count in excess of 20,000, and still be restored. Muller[1] has shown that there is an actual destruction of erythrocytes following inhalation of nitric oxide fumes with jaundice, and an accompanying increase of bile pigments in blood and urine. There is no doubt that men who have been gassed several times are more sensitive to the inhalation of gases evolved from explosives, and should not be returned to work with a risk of being gassed again. Where the concentration is low men do not develop any of the sequelae mentioned, and can continue work indefinitely. I have seen a number of instances where they have worked for several years. Where recovery occurs after a severe gassing, they still complain of headache, sleeplessness, inability to lie down at night and loss of appetite.

The period of incapacity from work varies from six days to six weeks.

Nitrogen oxides, beside their irritating and corrosive action, possess also a slightly narcotic and anesthetic action. Consequently, the defense reflexes and cough are inhibited, and the exposed workman may not realize the danger to which he is exposed.

The fumes of nitric oxide and nitrogen dioxide are found in those industries in which nitric acid is used, as in the preparation of acids, such as nitric, sulphuric, picric, and chromic; and in the production of toluene, metallic nitrates, methyl nitrate, celluloid, and nitrocellulose (gun-powder), collodion, Prussian-red, English-red, etc. Nitric acid is also used in such industries as metal works, jewelry, metal testing, manufacture of imitation pearls, engraving, manufacture of artificial leather, telegraphy, and explosives industries (nitroglycerine, dynamite, etc.), and in industries which use nitric acid compounds such as nitrates, nitrocellulose, artificial silk, photography films, celluloid, smokeless powders, nitrobenzene, and aniline. It may also be found in industries which do not use nitric acid, such as in the preparation of nitric oxide by the Haber process and the electric current process. Some men are peculiarly susceptible to these fumes, which may be due to the fact that they consume considerable quantities of alcohol, have tuberculosis, or are advanced in age, or have been subjected to a condition which decreases the resistance of the body, in which condition, they are more liable to show symptoms.

1. MULLER, J.: *Munch. med. Wchnschr.*, 72: 1860, 1925.

Medical and Surgical Service

—In a Large Plant—

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WHEN this subject was suggested to me I began to wonder just what fundamental differences there are between industrial practice in a large plant and a similar practice in a small plant—or in a group of small industries. I am inclined to think that there should be little difference—particularly so in the procedures, methods and purposes of rendering service. In speaking of a large plant I mean an industrial group of 5,000, 10,000 or 15,000 employees working as a single unit under one management. Here we generally find that the company assumes direct responsibility for the legal obligations from accidents and illnesses arising out of the nature of the employment. In other words, they are called "self-insurers." And here we generally find a well-established medical department organized and functioning according to clearly defined rules and responsibilities. In many instances the medical departments of our large industrial plants have had their inception as a small first aid dispensary, and with the growth of the organization there has been a gradual expanding of the functions and duties of the medical unit. Much of this growth has been due to two factors:

1. Workmen's compensation laws in the United States have placed a definite obligation on employers for injuries and illnesses arising from the nature of the employment, and that responsibility is measured in dollars and cents.

2. Industrial management has acknowledged a definite concern in the physical and mental well-being of its employees. The absence of skilled workers and key men, the disruption of production processes, the cost of labor turnover and training are recognized as a part of the financial debit in industry.

A perfectly natural answer to these problems was to establish a medical department to render service not based on philanthropy or paternalism but on sound business principles. It has been clearly demonstrated, particularly in the large plants, that the maintenance of a medical department with control over accidents, illness and absenteeism brings about a marked reduction in the cost to industry for these losses. Manifestly, a large industry is in a more favorable position to develop and maintain its own medical department and at the same time determine the extent of medical care that it wishes to render beyond the requirements of the law.

The small industry is not in such a favorable position, and the general practice is to underwrite the

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liability for accidents and illnesses with an insurance carrier. Here the obligation for the care and welfare of the employee is divided, and I am inclined to think that the interest is less personal in its relationship of employer to employee. Many companies who have an insurance carrier, however, set up a medical service for first aid work and medical care to a limited extent. This type of industrial medical welfare has been increasing in the past few years, and it offers an excellent field for future development. A recent survey by the American Medical Association indicates a growing interest in industrial medical service and the increasing recognition of the usefulness of such a career in the medical field. Between 1934 and 1938 there was an increase of 44% in the number of physicians specializing and devoting their full time to industrial practice.

I should like to mention briefly a few important considerations which I feel have a bearing on the ability of a medical department to render adequate service in a large plant:

First: The medical department should operate as a distinct and separate organizational unit in the company with clearly defined responsibilities and authority. It is my feeling that the medical department should come under the control of a high official of the company such as a vice-president or personnel manager—some official whose duties encompass questions of company policy as they relate to employer-employee relations and whose vision is beyond the intricate problems of production.

Second: The opinion and advice of the medical department should have recognized prestige as it relates to the nature of employment over every workman who is ill or disabled, whether that workman is under the care of the company doctor or his family physician. In other words, the supervision of every sick and injured employee should be transferred to the medical department until that employee is released from further care or observation.

Third: The personnel of a medical department should be large enough to render individual care to every employee who needs such service as comes within the scope of the duties of that department. There is nothing that will breed dissatisfaction or disdain in an employee quite as quickly as haphazard, rushed, ill-attended medical care. Every sick employee—every injured man—comes to the doctor with a personal problem more important to him at that moment than is any company problem, and it is within the power of the attending doctor to send that man back on the job confident that the needs of his well-being have been properly considered. You cannot expect a doctor to make 40 or 50 physical examinations day after day and yet give proper consideration to each examination on its own merits. And, you should not expect a doctor or nurse to have patients for surgical redressings standing in line to be taken care of from 8:00 A.M. to 4:00 P.M. five days a week. Personal service cannot be rendered on a mass production basis. As regards full-time or part-time doctors, I think that the field of industrial medicine and surgery, as it operates in the larger plants, is sufficiently important to warrant full-time service at an attractive salary. Never before has this special field offered such worthwhile opportunities to the recent graduates, and there is an increasing demand for capable men who have had practical training in industrial medicine and surgery.

Fourth: Shop rounds should be a part of the training of the physician in industry. Every doctor in the field of industrial service should have a clear understanding of the nature of the employment required of those persons to whom he is rendering professional care. It is my experience that many problems in personnel work interlock with responsibilities of the medical department. By that I mean that frequently the personnel manager is confronted with problems which need the opinion of a medically trained mind to evaluate properly; for example, the placement of handicapped employees. The doctor who knows the industry and the environment of different jobs can be definitely helpful in this individual problem. The heart case, the "apparently healed" tuberculosis patient, the old employee with high blood pressure, these and many others, present individual problems in which the medical factor is of enormous importance.

Fifth: All medical records, aside from the compensation records, should be privileged and no information from these records given out by the doctor without the consent of the individual. It is by maintaining a relationship as confidential and privileged as exists between the individual and his family doctor that worthwhile industrial medical service can be maintained.

LET US now consider the scope of medical and surgical service in a large plant. In assuming the responsibility for the care of all accidental injuries occurring during employment it is essential that the procedure for this service be expedient, adequate and dependable. In a large plant it is customary to have first aid stations placed at designated locations throughout the shops. A first aid kit may be an elaborate arrangement of antiseptics, bandages, restoratives and appliances; but unless the person handling the case has a competent understanding of asepsis and what *not* to do as well as what to do, there is a potential danger of complicating the original injury. With a medical department and doctors fairly accessible, I am firmly convinced that a first aid kit should consist only of sterile dressings, bandages, a tourniquet, a bottle of boric acid solution for caustic eye burns and nothing more. This first aid kit should be under the charge of a selected employee who is intelligent enough to know his own limitations. The thing to do is to apply the sterile dressing over the injury, retain with a bandage, and bring the injured employee to the medical department. Forbid the application of antiseptics, handkerchiefs, wiping cloths, and the practice of finger sucking to a fresh wound. Naturally, severe fractures, deep injuries, or coma require the personal attention of a doctor and the patient should not be moved except at the direction of the doctor. Green soap and sterile water generously used by doctor or nurse whose hands have been cleansed is more effective for preventing secondary infection than any antiseptic. A technique of handling and treating the case so that the fingers of the doctor and nurse do not come into contact with the wound directly or indirectly is good surgical technique. This requires training, understanding, and dependable nursing assistance, but it pays when you are handling from 40 to 70 cases each day. The application of bandages and splints so that an employee may resume his work and not contaminate a laceration is essential to good industrial practice. In Chicago, with hospital facilities available within a short distance of many large plants, it is expedient to move all serious cases or those requiring general anesthesia to the hospital by ambulance. First aid in such cases should be simple, sufficient and surgically safe.

There is another group of surgical cases that comes under the observation of the medical department although treatment is not rendered. These are non-industrial injuries—employees injured outside of work under the care of a doctor of their own choosing. Such cases need to to be handled with tact, understanding

and sympathy (for the attending doctor). If you have the confidence and respect of employees that you have known for years, it is natural that they will come to you for your opinion regarding the treatment rendered by another physician. Such situations should be met with a great deal of ethical reasoning. Reassurance to an injured employee that he is receiving proper treatment is not out of order and it does bolster his morale. Your request for a note or certificate from his doctor indicates a real interest in employee relations, and that is not out of order. Bear in mind that there is a distinct difference between industrial responsibility and personal responsibility. An industrial medical department should not infringe on the responsibility of the family physician. Collaborate, yes, but do not take the cases that are outside of your province.

The medical service in a large plant carries with it the responsibility for maintenance of the employees' health. This obligation can be divided into two phases:

First: The rigid control of all factors in employment which might tend adversely to affect the health and well-being of employees. There is more and more need of direct medical supervision of the working environment and a close cooperation of the industrial physician with those engineers who plan the practical means of eliminating and controlling the hazards of employment. In the past few years a great deal of emphasis has been placed on the control of harmful dust, fumes and smoke arising from various industrial processes. Industrial hygiene of itself has become a specialty in the engineering field. In addition, it is essential that the doctor have knowledge of the physical and mental requirements of various jobs in the plant so that problems of fatigue, neurosis, and mental and physical strain may be avoided. In reality, the doctor is the health officer of the plant, and, as such, is responsible for the sanitation, hygiene, and control of public health hazards as they affect the employees of the company.

Second: This phase, of equal importance, pertains to the individual health and well-being of each employee. Although not responsible for ordinary sickness among employees, there are sound reasons for industry to maintain records and to analyze all lost time illnesses of employees no matter what the cause. Such information has brought out the fact that 90% of absence due to illness is from causes in no way related to the nature of the employment. This indicates that a good share of the problems of health among the industrially employed falls clearly in the province of private medical practice. It is essential, however, to sound business and public economy to keep as many persons at employment as possible. A cooperative effort between the industrial physician and the family physician to keep lost time illness at a minimum is good industrial practice. We have found it most worthwhile to maintain a convalescent sanitarium in Wisconsin for the rehabilitation of employees of our company. This home is maintained without cost to the employee—it is under the care of the medical department, and 80% of the patients treated there are convalescing under the direction of their family physician.

Ambulatory treatment for minor illness while the employee is working is within the scope of industrial practice. However, when the nature of the illness necessitates care at home or elsewhere I feel this responsibility should be assumed by the family physician. We will frequently have an employee come in who is acutely ill. A careful examination will disclose, for example, an early appendicitis. I feel there is an obligation to the employee and to ourselves to work up the case—blood picture, physical examination and all—discuss the situation with the patient, ascertain the name of the family physician or surgeon of choice, and turn the patient over to that doctor with the benefit of all we have done. This is just humanitarian conduct. Another example—if an employee comes to you from work with clinical evidence of an early lobar pneumonia, is there any human justification why we should not examine that man to the extent of x-ray, complete blood count, and sputum typing to determine the exact condition? Then turn the case over to his family physician with the benefit of our inquiry and study. Specific treatment at the earliest moment has turned the tide in many pneumonia cases.

It has been an established practice in most large plants to examine every applicant for employment and measure him against a given standard of physique. If, in the opinion of the examining doctor, the applicant is physically fit, he is approved for employment. If not, he should be sent back to the employment department. I am quite emphatic in the opinion that the doctor should not be put in the position of determining whether a man gets a job. That is the employment problem. The examining doctor should merely determine whether the man is physically and mentally fit to do the job to which he is assigned without risk to himself, to his fellow workers, or in the interests of the company by whom he is employed. Manifestly, this procedure necessitates by the doctor a first-hand knowledge of the various jobs and the requirements of the work on the man.

Last, but not least, I would like to mention the importance of records in any type of industrial practice. These written reports should be concise, clear and comprehensive. The first record is the physical examination at the time of employment. The last one is previous to the termination of service. Between these two periods there should be a report covering every accident, illness, every change of job, and every periodic examination to which the employee has been subject. As mentioned before, these records should be considered as confidential and privileged and accessible to no one without the consent of the employee. Each record constitutes a report the value of which increases proportionately with the years of service of the employee. In the study of debilitating disease and in the problem of differential diagnosis these records are of enormous value. In a large plant of 10,000 to 15,000 employees with service records ranging from two to 40 years, you can understand what a valuable library these medical records offer for the study of disease and disability. Hypertension, coronary disease, arthritis—are they more than casually related to the nature of employment? When is pulmonary tuberculosis arrested? Is there such a condition as potential hernia? What is medical disability, and can it be measured? Do the disabilities of age—senescence—progress more rapidly in certain types of employment? There is a wealth of material for these studies in the records of a large industrial organization.

I HAVE given you a picture of medical and surgical service in a large plant. There is no reason why the small plant or a group of small plants does not offer the same opportunities for industrial practice. In the small unit the relationship between employee, doctor and management is probably not so personal, but it should be. Why can't the insurance carrier, the doctor and the management work out a comprehensive program for medical care which will entail physical examination, shop rounds, surgical and medical service, placement of temporarily disabled employees, periodic examinations of executives and key men, medical advice on sanitation and hygiene, and consultation service

on industrial health problems? The National Association of Manufacturers has shown that where a comprehensive health program is established in a plant of 500 employees there is a net saving of $5,600 to the management each year, with an even higher saving in wages to the employees.

A relatively small group of industrial physicians and surgeons has, during the past 30 years, built a pattern for medical service in industry that has been acceptable to the employer, the employee and the social and humanitarian needs of a great mass of working people. Possibly this pattern of medical service in our large industrial plants can act as a guide in the organization of a type of medical care for persons in the low income brackets and thereby offset the sinister propaganda for state medicine that is becoming so pronounced.

Discussion

ROY J. DEMOTTE, M.D. (Chicago): It is an honor to be asked to open the discussion on a paper like this. I know of no one better fitted to present such a subject than Dr. Chivers. There is very little of value that can be added. However I would like to emphasize one or two points, and probably sub-join a couple of minor ones. I have always felt that a doctor in industry is just a doctor. I have never liked the terms "industrial doctor" or "company doctor." The practice of medicine in industry is, after all, just the practice of medicine. There are a few special problems, but the main part of the value of industrial medical service is confidential association between the doctor and the patient. To establish this, the personnel of the medical department is important, and the support of the men of the department should be infused through the whole group of employees in that plant. There should be a true conception of the proper relationship between the employees and the medical department, and the practice of medicine in industry should be on as high a plane as in private practice. We, in the medical department, are really a maintenance department. Every factory has its maintenance department to keep its machinery going, and the medical department is a maintenance department to keep the human machinery at work. Of course, analogy is not perfect, because there is a great deal more necessary to keeping the human machine at work than the mechanical machine. There is the personal side, with the vast differences of personality that must be dealt with in consultation. I think this is a most important point in the success of a medical department in industry.

We have always felt that every large industry should have a dentist connected with its medical department, in cooperation with the doctors in charge. The dental and mouth focal infections are the cause of a large percent of chronic ailments in industry among the working people. The mouths of working people are usually very poorly cared for; and there is no single element of the service we have had in our department that I feel is of more value than that given by the dentist. For the last 15 years we have had a dentist. We do not restore teeth. The dentist's job is to teach our employees to care for their teeth and to help eradicate infections in the mouth. We make no restorations or plates. That has to be done by the private dentist. But having a dentist in the plant has been of great value.

Something else which I believe is of great value is the visiting nursing service. A great many men working on the job have sickness at home. They are worried about home conditions, and their work suffers as a result. If they feel that a nurse is calling at their home daily, or two or three times a week, it takes a great deal of worry off the mind of the man in the shop. There is no service we have rendered that is more gratefully received than the work of the visiting nurses.

Now to end up with just what I started with. I still feel that the human relationship—the confidential relationship between the doctor, the nurse, and the employee is the most important factor in the success of this work.

URBAN E. GEBHARD, M.D. (Milwaukee): I would like to ask, Dr. Chivers, what do you think of a plant assuming the responsibility of its employees' families?

DR. CHIVERS: Of course my answer would depend on and be influenced by the conditions around the plant and in the vicinity. I can imagine a plant—a mining industry—isolated, off in the hills where every employee in the town works either directly or indirectly in the interests of the mine. Or a plant in the woods, in a lumber camp. Excluding that sort of a group, however, my own feeling is that the field of industrial medicine and surgery is more clearly defining its scope and that its scope does not lap over to the field of private practice. When an employee is paid a sufficient salary to maintain a proper standard of living, I think that in that proper standard may be included the necessary care for his dependents. So far as the doctor in the organization is concerned, I am much more in favor of the doctor confining his interests and activities and influences to those matters only in which the employer is directly responsible.

The Management of a Blood Bank

—In a Moderate-Sized, or Industrial, Hospital—

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THE efficacy of preserved blood from blood banks has been recognized by those familiar with its use,[1, 2] and it is now well known that the number of transfusions need not be large to make a blood bank a practical as well as a profitable investment for a hospital; an average of 30 to 40 transfusions monthly is sufficient. At Sea View Hospital, a municipal institution, the transfusions average 50 a month, but even on this small scale many lives have been saved owing to the immediate availability of blood for transfusion. At the Queens General Hospital a blood bank was established in June, 1938. The average of monthly transfusions is about 125 and in this hospital, as in other municipal hospitals with blood banks, the Department of Hospitals has saved the thousands of dollars previously expended for professional donors.

In spite of the admitted advantages of preserved blood, definite procedures in the handling of the blood must be carried out and certain limitations in its use realized[3, 4] if the maximum benefit is to be attained. It is the purpose of this paper to describe the management of a blood bank, to point out the advantages and limitations of the five types of blood available in an institution possessing a blood bank, and to enumerate the indications for the use of preserved blood.

Personnel of the Blood Bank

IN establishing a blood bank very little of the normal hospital routine need be disturbed. The bank should be under the supervision of a member of the attending staff from one of the surgical services or the pathology department. As a primary requisite, he must have had some experience in blood groupings, transfusion reactions and in the possible uses of various kinds of blood in order that he may act as a consultant to decide pertinent questions as they arise. The senior house officer in surgery is responsible for the drawing of the blood and its proper handling by the interns.

When several services use the bank, it is a good policy to assign each intern a definite day of the week to draw blood from all the donors. In this way no time is lost by donors waiting for "some" doctor to take the blood, and any fault in technic can readily be traced. If the refrigerator is kept in the operating room or in a central supply room, a nurse should be assigned to the blood bank. Her duties consist in placing the blood in the refrigerator and maintaining it at a constant temperature, keeping the books for the bank,

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caring for the donor's and recipient's sets, and handing out blood when requested. The blood typings, cross-matching and serology are done by either a technician or a member of the house staff in pathology. Serological tests should be done at least twice weekly and preferably three times a week so that no time is lost in using the blood.

Apparatus

REFRIGERATOR: The most essential item in a blood bank is the refrigerator. This need not be very large but should be used, if possible, only for the storage of blood, since constant opening of the door causes fluctuations in temperature. The temperature of the refrigerator should be constant at 4° C., although variations from 0° to 5° are permissible. It is a good plan to separate the various types and kinds of blood in the refrigerator so that one can see at a glance the exact status of the bank. (Fig. 1.) Some institutions separate the bloods of white and colored donors although there is no morphological difference in the blood of these races.

Fig. 1

Fig. 2

DONOR'S SET: At least six donor's sets should be available for use each day. These are sterilized under 15 pounds pressure for 30 minutes and contain the following (Fig. 2):

1000-cc. blood bank bottle.
18-in. piece of amber tubing with one glass adapter and one glass needle adapter.
18-in. piece of red suction tubing with two glass connecting tips.
10-cc. syringe; 2-cc. syringe; 15 gauge 1½-in. needle; 25 gauge ½-in. needle; 3 hand towels; 4 x 4 compresses; pasteboard bottle top; Duro rubber band.

RECIPIENT'S SET: The recipient's or transfusion set differs very little from the ordinary infusion set. It contains the following:

Kelly or Cosmo flask with gauze and filter top.
Amber rubber tubing with drip bulb and glass needle adapter attached.
5-cc. syringe; 18 and 19 gauge needles; compresses.

Technic of Withdrawal of Donor's Blood

BEFORE a donor is used, he is questioned as to syphilis, gonorrhea, malaria, tuberculosis, allergy and recent infectious diseases. His heart, lungs and blood pressure are examined and a hemoglobin determination done. It is preferable to have the donor fast for several hours before the blood is drawn because recently ingested food may cause an allergic reaction in the recipient.

The blood is drawn in the operating room or in one of the treatment rooms on the ward. Careful sterile technic must be followed because this procedure offers the greatest opportunity for contamination.[5] The donor is placed on the table, his arm prepared with alcohol and iodine, and draped with a sterile sheet and towels. About 75 cc. of the sterile sodium citrate (2.5%) solution is drawn into the blood bank bottle through the needle and tubing which is to be used for drawing the blood. This procedure not only ascertains whether the apparatus is working perfectly, but also prevents clotting in the system during the phlebotomy. A sufficiently large vein in the antecubital region is chosen and a small amount of novocaine is injected into the skin above the vein. The tourniquet is tightened and the 15-gauge needle, attached to the needle adapter, is inserted into the vein (Fig. 3). The bottle is shaken very gently in a rotary motion after each 100 cc. has been drawn to insure adequate mixing with the citrate solution. Vigorous shaking of the blood is to be avoided, for this causes destruction of the erythrocytes and increases the rate by which potassium is given up by the cells.[6]

When 500 cc. of blood have been drawn, the tourniquet is loosened, the glass needle adapter removed from the needle, and an additional 10 cc. of blood withdrawn into a syringe. This syringe is given to the nurse for

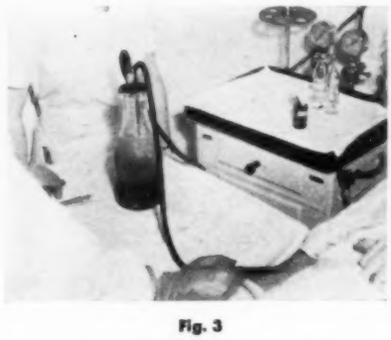

Fig. 3

Fig. 4

deposition in three test-tubes: 5 cc. in one tube for serology, several drops in a second tube containing 5 cc. of sodium citrate, and the remainder in a dry tube. The blood in the second and third tubes is to be used for blood typing and cross-matching. The suction cover is removed from the bottle and immediately replaced with the pasteboard cap and sterile gauze. A tag labeled with the donor's name, race, the date of withdrawal of the blood, and a space for the blood group is attached to the bottle. The bottle is then placed in the refrigerator and the data entered in the blood bank book. The three test-tubes containing the 10 cc. of blood are sent to the laboratory for serology and typing. After the typing has been done, the second and third tubes are returned to the blood bank and attached by a jacket to the bottle.

Technic of Obtaining Placental Blood

IN hospitals having an obstetrical service placental blood can be collected. After delivery of the infant, a nurse who has not assisted in the delivery wipes a portion of the umbilical cord with an alcohol sponge. The cord is cut at this spot and held with thumb forceps above a funnel containing several layers of gauze. The end of the funnel is set into a small bottle in which 20 cc. of sterile sodium citrate had previously been placed. About 100 cc. of blood are collected from the placenta and the cord then held above three test-tubes into which the blood is allowed to drop. The blood in the test-tubes is to be used for serological and blood

typing tests. A placental blood slip containing the following information is made out:

PLACENTAL BLOOD SLIP

Mother's Name ..... Type .....
Serology .....
Complications of Pregnancy .....
Amt. Blood Collected ..... Date .....
Type ..... Serology .....

.....
Signature

Technic of Blood Transfusion

WHEN a doctor desires to give a transfusion, he types the patient and fills in the following card:

REQUISITION FOR BLOOD TRANSFUSION

Patient ..... Ward ..... Hist. No. .....
Diagnosis ..... Hb. .....
Reason for Transfusion ..... Amt. Req. .....

Type Required ....
Dr. Requesting Blood
..... M.D.
Approved

This card is brought to the nurse in charge of the blood bank. The nurse takes the test-tubes from a donor of the same type as the blood requested and sends them to the laboratory for cross-matching with the patient's blood. The use of universal donors is to be avoided except in cases of emergency.[7, 8, 9] Cross-matching with cells and serum of donor and patient should always be done. If this procedure is neglected, incompatibilities due to the presence of atypical agglutinins may not be discerned and may give rise to severe reactions.[10] A slip, printed as follows:

CROSS-MATCHING SLIP

Patient's Name ..... Type .....
Donor's Name ..... Type .....
Compatibility ..... Date .....
Signed .....

is then sent to the blood bank where it is checked by the nurse in charge and by the doctor requesting the blood. Each intern should give his own patient the transfusion after supervision by the house officer in charge of the blood bank. Before taking the blood from the bank, the intern fills in a transfusion card:

TRANSFUSION CARD

Patient's Name ..... Type .....
Donor's Name ..... Type .....
Age of Blood ..... Compatibility .....
Reason for Transfusion .....
Amt. Required ..... Date Taken from Bank .....
Amt. Used—Reaction .....
Hb. on Third Day after Transfusion .....
..... M.D.

The nurse then gives the doctor the blood and sends a transfusion set, a bottle of normal saline and a reaction slip to the ward where the transfusion is to be given. About 50 cc. of saline are poured into the flask and the air let out of the system before starting the infusion. When the infusion is running into the vein properly, the blood is poured from the bottle through the gauze filter into the flask. The speed of flow is regulated by the metal screw clamp on the rubber tubing (Fig. 4).

Blood Plasma

PRESERVED blood is best used up to seven days from the day it has been drawn. From the seventh to the tenth day of storage a hemolysis test[5] to determine the extent of destruction of the erythrocytes should be done. Blood older than 10 days should not be used. However, this blood need not be discarded for it is a simple procedure to siphon off the supernatant plasma by placing a long glass tube into the plasma and applying suction to the other end of the tube. The plasma can be stored in the refrigerator for an indefinite period. Although plasma has been used for heterologous types without the occurrence of reactions,[11] we feel it is safer to give plasma to a homologous group.

Indications for the Use of Various Kinds of Blood

TRANSFUSIONS are usually given to raise the blood pressure by increasing the blood volume, to provide functioning erythrocytes and to increase the coagulability of the blood. Five types of blood are available in an institution possessing a blood bank. These are:

1. Unmodified whole blood.
2. Fresh citrated blood.
3. Preserved or bank blood.
4. Placental blood.
5. Blood plasma.

UNMODIFIED WHOLE BLOOD is undoubtedly best suited for severe acute hemorrhage or to increase the coagulability of the blood in such conditions as hemorrhagic diseases, purpura, hemophilia, and jaundice. It has a number of advantages, namely, no foreign substance has been added, the platelets are intact and it can be given rapidly. Its use is limited in that a proper donor is not always available, a direct transfusion (a more difficult procedure than an indirect transfusion) must be given, the blood must be injected rapidly or clotting will occur, and it cannot be given rapidly in persons with weak myocardia or in old persons with respiratory disturbances.

FRESH CITRATED BLOOD less than 24 hours old is just as effective as unmodified whole blood except for increasing the coagulability of the patient's blood. However, vitamin K has displaced the use of blood transfusion to a great extent in the treatment of jaundiced patients.[12] Citrated blood has the advantage that it can be given as rapidly or as slowly as desired. Moreover, the citrate solution alkalinizes the urine and prevents kidney nephrosis should a hemolytic reaction occur.[13, 14]

PRESERVED BLOOD stored up to seven days is practically as effective as fresh blood in the treatment of hemorrhage and shock and where the need is for erythrocytes. The question as to the time limit for the storage of blood arises. In collaboration with Dr. A. S. Wiener,[3] the author compared the survival of transfused erythrocytes in patients receiving blood stored for varying periods up to 21 days. *While fresh blood or blood stored up to seven days survived for periods of from three to four months, blood stored as long as 21 days survived less than one day.* The appearance of icterus could not be detected in patients receiving blood less than eight days old, whereas icterus regularly occurred—at times with hemaglobinemia and hemoglobinuria—in patients receiving older blood. We concluded that blood should be stored up to seven days to obtain the best results from a transfusion. After that time—up to 10 days—a hemolysis test should be done before using the blood. Plasma, siphoned from the bank blood, may be used for an indefinite period thereafter.

PLACENTAL BLOOD, as advocated by Goodall,[15] has the advantage of usefulness in pediatric cases where small

transfusions are usually required. Barton[16] and others dilute placental blood with 125 cc. of "I.P.K." solution. We feel that such a dilution detracts from the efficacy of the blood and that 15 cc. of citrate, as used at the Queens General Hospital preserves the blood as well. For adults, placental has the disadvantage that four or five different bloods must be used, increasing the number of cross-matchings and also the possibility of a reaction.

BLOOD PLASMA is readily obtainable by merely siphoning off the supernatant fluid from preserved blood that has reached its expiration date. Plasma may be stored indefinitely in the refrigerator but should be used for a homologous type.[17] Aside from its usefulness because of its immediate availability, plasma has been used to great advantage in the treatment of severe burns,[18, 19] in which a hemoconcentration of blood occurs. The use of excessive quantities of dextrose and saline results in a water-logging of the tissues which of itself may hasten the demise of the patient. Trussler[20] states that repeated transfusions have proved life-saving in severe burns. As an emergency measure in hemorrhage and shock plasma may be used.[21] Whole blood can always be given later if necessary. Levinson[22] believes that while whole blood is the best restorative agent in acute hemorrhage, unless the hemorrhage is severe, plasma, by restoring the blood volume, prevents shock. In nephrosis, where the need is for serum protein, blood plasma is efficacious.

Advantages of a Blood Bank

THE greatest advantage of a blood bank is that it makes blood readily available, thus saving many lives and shortening convalescence. This availability is especially important in the prevention and treatment of shock following trauma or surgical procedure.

Centralization of the transfusion set-up and the handling of the blood by the same personnel over a comparatively long period adds to the efficiency and safety of the procedure.

Freshly preserved blood, which can be given at any rate desired, is preferable to all other kinds of blood in the treatment of hemolysis resulting from poisoning by drugs or metals.

Preserved blood up to two or three days of age is efficacious in the treatment of infectious diseases; the anti-bacterial potency of blood older than this diminishes too rapidly to be of benefit.[4]

Finally, blood banks are economically feasible for a hospital inasmuch as the blood is contributed by family and volunteer donors so that the expense of professional donors is eliminated.

Summary

A PROCEDURE for establishing and conducting a blood bank has been discussed.

2. The technic of withdrawal of donor's blood and of administering a transfusion including precautionary measures against reactions has been described.

3. Unmodified whole blood is most efficacious for severe acute hemorrhage and to increase the coagulability of the blood. Its use is limited in that it is not immediately available and a direct transfusion must be given.

4. Fresh citrated blood is just as effective as whole blood except to increase the coagulability of the patient's blood.

5. Preserved blood stored up to seven days is practically as beneficial as fresh citrated blood in the treatment of hemorrhage and shock. Its great advantage is its immediate availability.

6. Blood plasma may be used for an indefinite period. It is useful in tiding the patient over the period until whole blood can be obtained and has proved best for the treatment of severe burns.

7. Placental blood may be used for small transfusions and is especially suited for pediatric cases.

8. The establishment of blood banks has been responsible for the saving of large sums of money by hospitals.

[We wish to thank Mrs. F. E. Workman, Nurse in charge of the blood bank, and Mr. Bernard M. Cohn, photographer, of the Queens General Hospital, for their cooperation in the preparation of this paper.]

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Milestones in Industrial Medicine

T. Lucretii Cari De Natura Rarum

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VALUABLE information has been handed down to us by some of the early poets, notably Juvenal, Martial, Lucretius, and others. Lucretius, although having no medical training, was a keen observer, and in his poem "De Natura Rarum" his observations provide information concerning some of the diseases of his period, and even the diseases characteristic of certain occupations.

While many of his conceptions as we view them today were not accurate, yet, considering the years in which he lived and wrote, 98 to 54 B.C., his observations are remarkable. Lucretius was supposed to have been insane and to have committed suicide. During his lucid intervals he wrote one of the finest poems of classic antiquity. This was subsequently edited by Cicero, who was not fitted for the task of correcting the work of a genius so different from himself.

Lucretius belonged to an aristocratic old Roman family, but the details of his life are meagre and vague. Nevertheless, his personal force is so remarkable and so vividly impressed on his poem that we seem able to form a consistent idea of his qualities and characteristics. He appears to have been thoroughly familiar with the social life of his day, but, unlike the men of the time, to have found a great deal of pleasure in solitary wanderings in the mountains. His poem shows him to have been a student of the best in Greek and Roman literature and familiar with the writings of

"De Natura Rarum" has been translated in blank verse by R. C. Trevelyan and the poem published by The MacMillan Company, New York.

Where actual translation is used here, the verse is from this translation.

Epicurius, Empedocles, Democritius, Anaxagoras, Plato, Hippocrates, Homer, Euripides and other well known Greek writers, and Pacuvius, Lucillius and Ennius among his own countrymen.

Of his work it has been said that there is no work in any literature that produces a profounder impression of sincerity. No writer shows a juster scorn of all mere rhetoric and exaggeration. No one shows truer courage, not marred by irreverence, in confronting the great problems of human destiny, or greater strength in triumphing over human weakness. No one shows truer humanity and a more tender sympathy with natural sorrow.

T. LUCRETII CARI
DE
RERUM NATURA
LIBER I.

The peculiarity of the poem of Lucretius that makes it unique in literature is that it is a reasoned system of philosophy (Epicurean) written in verse. His knowledge of medicine of his time was extensive, and "De Natura Rarum" throws most interesting sidelights on anatomy, physiology, dietetics, hygiene and climatology of Roman and Greek medicine, and concludes its sixth book with a famous account of the plague of Athens. The particular volume of which the first page is illustrated was published in 1749 and is an exceedingly fine example of the work of the famous John Brindley Press, of London, in a beautiful contemporaneous morocco binding.

The poem should not be appraised entirely by the nature of its material, that is, on the accuracy of the scientific and philosophical ideas. It should be weighed as a poem and be judged by the lucid progress of Lucretius' exposition and the splendor of the poetry, and consideration should be given the imaginative scope and comprehensiveness of his vision of nature.

While it is the fashion to deprecate the system of Epicurean philosophy as a mere eclectic patchwork, clumsily pieced together out of the speculations of Democritus, Mr. Santayana states that: "Epicurius saw the world as one great edifice, one great machine, all its parts reacting upon one another, and growing out of one another in obedience to a general pervasive process of life."

CONSIDERING the content of the poem specifically, we find that Lucretius, because of the strength of the wind, the effects of heat and smell, arrives at the conclusion that there must be atoms and elements, although they cannot be seen. He also mentions that, things being indestructible, nature must make new out of the old.

The first reference of Lucretius to a subject which may be considered occupational in nature is the one in his second book to the Phrygian Curetes and their playing at times together a game of arms, in which they leap in rhythmic dance, gladdened at sight of blood; this being his first reference also to the important occupation of that time, that of the soldier.

Again, near the end of this book, he refers to luxuriant crops and rich vines for mankind, and the wearing out of our oxen, and the strength of our peasants. "We use up our iron tools, yet hardly do we win a sustenance from the fields."

In Book Three he again refers to military occupations, mentioning that stories are told of chariots armed with scythes, reeking with mingled slaughter, which often times have lopped away men's limbs.

In Book Four he mentions building construction: "As in a building, if the rule first used be warped, if the square be untrue and swerve from the straight line, if anywhere your level sags the least jot, the whole house must needs be faultily built."

And in Book Four he speaks of occupations and the fatigue which accompanies them:

> And generally to what pursuits soever
> Each of us is attached and closely tied,
> Or on whatever tasks we have been used
> To spend much time, so that therein the mind
> Has borne unwonted strain, in those same tasks
> We mostly seem in sleep to be engaged.
> Lawyers imagine they are pleading causes
> Or drafting deeds; generals that they are fighting
> In some pitched battle; mariners that they still
> Are waging with the winds their lifelong war;
> And I that I am toiling at my task,
> Questioning evermore the nature of things.

Again, in the same book, reference is made to hellebore as a rank poison, which is deadly to humans, but which makes goats and quails grow fat.

In Book Five, he speaks of the force of nature, and of husbandry, describing how the force of nature would soon overspread with thorns unless resisted by man's force, and then going on to tell of the preparation of the soil by the farmer.

In Book Five also he refers to the rivers, which formerly flowed with gold.

And again he writes of husbandry, the plough's stalwart guide, and the lopping of old boughs from the tall trees with pruning-hooks, which indicates that even before the birth of Christ attention was given to horticulture, and that this work was being done with metal tools.

The production of clothing had progressed to an advanced stage in these early days, as shown by Lucretius' reference to: "Plaited garments came before the dress of woven stuff. Weaving comes after iron, since weaving tools need iron to fashion them. By no other means can such smooth things be made as heddles, spindles, shuttles and clattering-yarn beams."

At first men instead of women worked in wool, and in general the male sex was said to be far the more skillful and ingenious. The rough husbandman chided them, however, and they then took their share in the heavier toils.

Lucretius continues that nature first taught mankind how to sow, and first prompted them to graft for berries, and how acorns dropping from the trees would put forth, in due season underneath swarms of seedling.

It was also then learned to insert grafts into the boughs and plant young saplings in the soil about the fields. Meadows and ponds are described, and crops and glad vineyards covering the hills and plains, while grey-green boundary strips of olive trees might run between the fields, whole countrysides adorned with rows of fruit-bearing trees.

Music and musicians are referred to: by degree they learnt those sweet sad ditties with the pipe, touched by the fingers of the melodist.

The occupational watchman was also present in this ancient period, as shown by the observation that singing and the use of reed pipes were customs handed down to the watchman of Lucretius' day. And further referring to earlier times, Lucretius speaks of the wild beast skin which was used as clothing, but which fell into contempt as the skins were replaced by gold trimmed cloths. These newer robes were described as "Broidered with large designs of gold thread."

Toward the end of Book Five, reference is made to sailing, and also to poets:

> The sea was gay with flitting sails, and true
> were jointed in league of friendship and alliance
> When first poets made record in their songs
> of men's deeds: For not long before this time
> had letters been invented.

Notice is likewise taken of sculptors and painters, as shown in the lines: "Poems and pictures and the chiselling of fine-wrought statues."

In Book Six he observes: "A ball of lead whirling through a long course will even melt." And again, reference is made to sulphur, and to brass and gold.

Steel was in use, and poison recognized, as shown by the following: "You could not prove that he had died by steel or by cold or disease, or maybe poisoning."

The presence of various metals in the earth was acknowledged:

> All things of every kind: Many they serve
> for food friendly to life: Many with power
> and to reflect diseases and so hasten death.

The means by which some of these elements entered into the human body also were noted:

> Many harmful elements pass through the ears,
> and through the nostrils, and many make their way
> that are noxious and rough; and not a few
> should be avoided by the touch.

The most direct reference to the diseases of occupations in the poem is contained in the following lines:

> And have you not
> also observed how even within the earth,
> Sulphur is generated, and bitumen
> hardens into a noisome-smelling crust?
> And indeed, when they are followed up the veins
> of silver and gold, searching with tools
> deep in the secret places of the earth,
> What smells Scaptensula breathes from below!
> Then what mischief do not gold-mines exhale!
> As they ravage men's faces and complexions!
> Have you not seen or heard how they are wont
> to perish in a short time, and how soon
> their vital power fails those who are held fast
> in such employment by necessity's
> strong duress?

The effect of the magnet upon iron filings, "which makes them leap madly about inside brass bowls," is mentioned, and how stones are cemented by mortar, and wool is spoken of, and a sea-purple dye, and the murex united with the wool.

And another comment on metals is contained in the last book:

> Then again is there not one thing alone
> that unites gold to gold; and is not brass
> soldered to brass by tin?

The poem is finished by a detailed and accurate description of the severe plague of Athens. While this is an interesting description, it does not refer to the effect of the plague upon any of the occupations other than that all commerce was disrupted.

Some years ago Macaulay took with him to India a copy of Lucretius and read it through many times, writing notes in the margins. These notes are available, and we can, perhaps, obtain from some of them an accurate estimate of the poem.

While Macaulay had only fun to make of the scientific phases, he speaks with the greatest praise of the poetry itself, making such remarks as: "beautiful writing"—"very neat and clear—sublime beyond any passage of the kind in poetry."

Industrial Health Program

—Organization and Cost—

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OF THE several methods of approach to the health problems of an industrial plant, the one that may be expected to produce uniformly good results is that one based on periodic complete physical examinations of the employees. This is the type of program in effect at various operating units of the Inland Steel Company. The program at the steel works at Indiana Harbor now has six years of experience behind it, and it is from this experience that the present material is drawn.

The physical examination routine in use has been described in previous reports and will be recognized by those present as the routine devised by Professor D. E. Cummings for the examining programs at the iron mines in upper Michigan. As a preliminary to an examination, each employee is interviewed by a trained clerk for the purpose of completing an occupational and a medical history. The physical examination is made by a physician in the privacy of a well equipped examining room. A minimum of 20 minutes is allowed for the completion of the examination. Thereafter a chest x-ray film is taken, and certain tests are made of the blood and urine.

The examination routine as described is satisfactorily effective in discovering most of the diseases responsible for chronic disability and death among workmen. Some of the conditions discovered are also prominent in the problems of personal and plant safety, and some are contagious. They may on occasion be important factors in compensation questions. Listed in the order of the frequency with which they occur, the conditions are dental and visual defects, hypertension, pulmonary tuberculosis, syphilis, hernia, heart disease, Bright's disease, and diabetes. The most frequently missed diagnoses are of the various diseases causing chronic indigestion, and cases of so-called silent coronary heart disease and early cancers of the abdominal viscera.

The complete physical examination serves as a point of departure into various channels of the full program:

1. It serves at once to establish a satisfactory relationship between workers and the medical department.
2. Employees with treatable defects are referred to their personal physicians or to proper agencies for supervision.
3. Occasionally during the examination itself, and more frequently during the interview that follows, it is possible to do some effective personal health education work.
4. The findings at an examination may reveal the

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necessity for a job transfer in the interest of the safety of a group of fellow workers or of a whole department. A timely job transfer may on occasion also be the means of delaying total disability in the face of a chronic, slowly progressing illness.

5. The records of the complete physical examination establish the base line from which findings at subsequent examinations are measured. The full program should include partial examinations of men who report illnesses while at work, and of men who are returning to work after an absence due to illness. The full program should also include periodic partial examinations of men known to be working with toxic materials. Intelligent decisions are more readily made at such times if records of previous, complete examinations are available.

6. As physical examination records accumulate, they should be made the subject of constant study and review by the medical staff. The information gained may be correlated with the knowledge of production men and hygiene and safety engineers, concerning the work environments of the examinees. There is thus developed a body of practical essential information pertaining to a specific plant.

Organization of Staff and Work

THE essential feature of an efficiently operating staff which is to do the work described is the correct ratio of doctors to clerks and technicians. At the present time the salaries of two full-time physicians are charged to the Examination Clinic at the Indiana Harbor Works. Associated with them are two clerks, two technicians—either of whom can do x-ray work, as well as routine blood and urine tests—and a combination janitor and laboratory-diener. This group of seven men can do twice as much work as a combination of four men, viz., an examining physician, a clerk, a technician, and a janitor-diener. The scheduling of employees for examinations is done by a clockhouse or employment office clerk. A small fraction of his time is used in rendering the service, and his work is not charged to the examining clinic. The seven members of the staff work full time at their jobs. Neither of the physicians is engaged in a private practice.

The clinic staff have at various times been directly answerable to the general superintendent of the plant, the personnel director, and, more recently, to a medical director who in turn is responsible to top management. All of the schemes have worked satisfactorily. In the end, an enterprise such as this can succeed only if top management wants it to be a success. The exact organization of its administrators is of secondary importance.

At our examination clinic we schedule our work, and we think of work done in units of complete examinations. A fairly constant ratio is experienced between the number of examinations and the total work done. Thus, the complete examinations made in any one day usually represent a third of the number of men seen that day. The divisions are about as follows: For every 10 men given complete examinations, an additional 20 will have been seen. Of the 20, half (or again 10) will have been summoned for interviews regarding findings at previous examinations, for supervisory partial examinations for known defects, and so on. The remaining 10 are divided about as follows: Five are examined for return to work following sickness absences; two are specifically called in for partial examinations with reference to working with known toxic substances; two will have dropped in voluntarily because of newly developed health problems; the remaining one will be in for any of various reasons. It is the author's belief that a similar program of physical examinations, established in almost any large plant, will develop a similar work load. If the basic work of complete examinations is done, the associated services may be expected to follow in a uniformly quantitative manner.

Costs

IT FOLLOWS from this that a discussion of the cost of the program can be simplified by making all charges against complete examinations. The complete examination is viewed as the unit of work done in the program, and the cost per examination becomes a cost unit that should prove useful in any thought or discussion of a similar program.

Salaries of staff members have represented 70% to 80% of the cost of the program described. It is evident, then, that the cost per examination is most influenced by the salary level of the staff and the efficiency level at which the staff operates. Probably the actual peak load at which the staff of seven men could work is 90 complete examinations a week for 50 weeks of the year. The schedule calls for 10 examinations per half-day for nine half-days a week. In a 5½ day work week, this allows two half-days for general clean up of back work and some study of the results being produced. Follow-up work and partial examinations, of course, flow through the clinic at a fairly constant level for the full 5½ days of the week. Plant visits, when made by one or the other examining physician, are booked for one of the half days in which no complete examinations have been scheduled. A top work load for the staff, then, for the past year would have been 4,500 complete examinations, plus twice as many partial examinations and/or interviews. The actual number of complete examinations made during the past 12 months was 3,560. There was an efficiency of operation of 79%. Almost all of the efficiency loss rests in the difficulty of getting workers to keep their appointments for examinations. The scheduling of the examinations is of itself a complex procedure, involving consideration of days off and the shift being worked, plus the innumerable and unpredictable events in the personal lives of the workers. Attempts have been made to over-schedule by about 30%, thus planning on a certain number of failures of appearance. All the scheduled men do occasionally appear, and the inconvenience caused them by the prolonged wait for service has caused growling of a quantity not considered healthy for the health program. We have, therefore, dropped back to the original schedule and are hoping for the passage of the years to achieve cooperation by the slow means of education and persuasion.

The seven men of the clinic staff during the past 12 months divided a total salary of $19,300. When costs of materials and overhead, exclusive of rent and heat, are added, the total cost amounts to just under $25,000; and the cost per examination comes to slightly less than $7.00. It should be recalled here that the sum pays for the follow-up work and general supervisory work which necessarily accompany the examination program. If the program were cut in two, presumably the higher ranking and more competent segment of the staff would be retained to do the work. If the remaining necessary four men were retained at salaries somewhat less than their present levels, the cost per examination would increase to $8.60. It is possible that a comparable program, employing a staff of seven men, but located at an isolated community where living costs are lower, could be run for a total payroll of $15,900 per year. The cost per examination in the cir-

cumstance would be $5.70. A program half its size might be run with a staff of four, all drawing lowest possible salaries compatible with acceptable work, without increasing the cost above the $5.70 per examination minimum. If the chest x-ray studies are made with the new equipment on miniature films, the final cost per examination can be reduced by 50c under any of the circumstances described.

I have frequently been asked how I can justify the expenditure of $25,000 yearly for a program such as this. Fortunately, the question has never been asked by my superiors, because I do not know a good, hard-headed answer. To my colleagues who occasionally pose the question, I have only been able to reply that the managers of our company are interested in making their plants highly desirable places in which to work. Our health program is one of the measures they are carrying on toward that end.

The Health of the Executive

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AT NO OTHER time in the history of our nation has the health of the executive been so vitally important as it is now. In times such as these the executive's health is not entirely a personal problem between his employer and himself; rather, he now has in addition a patriotic responsibility to his country.

In general, one might say that an executive is one who earns his living largely by the use of his mind, in distinction from the laborer, whose livelihood is largely dependent upon his body. Of course, the comparison is only a relative one; the mind cannot function with the greatest efficiency if the body is not healthy, and vice versa.

I have no information as to how many executives there are in this country, but when one considers that every large industrial and business organization employs hundreds of executives, and when other persons, who are actually executives, are included, such as bankers, physicians, lawyers, dentists, governmental employees and many others, the number constitutes an imposing and important part of our population.

For many years the importance of health measures for our industrial workers has been recognized. No other nation can approach the record we have made in protecting our workers against disease and accident. This may not have been carried out because of purely humanitarian motives, but it has paid well in dividends and the worker has received a proportionate share of the returns. One example of the results which have been obtained by safety and health measures will suffice. At the 1940 meeting of the American College of Physicians, Dr. G. H. Gehrmann[1] told us that 30 years ago in his company there were as many as 3,000 major injuries in one year, but that during 1939, with the development of safety measures, there occurred only 112 major injuries among 45,000 employees, a truly remarkable record.

No such health record as that can be credited to the executive's side of the ledger. It has been only during the past few years that industry has taken an active interest in the health of the executive, either before or after hiring him. Dr. Hugh Cabot once said, "While industry took a good deal of trouble in overhauling the applicants for jobs at a dollar a day, they quite lightheartedly took on an executive at $50,000 whose life expectancy was not more than a year." The head of a large corporation once remarked that when he hired an executive he paid him $100,000 annually on the theory that he would kill him in 10 years, and it may be assumed that he made some success in his promise. Most executives are highly trained and are difficult and often impossible to replace. They represent an investment in the business, and should be conserved as carefully as capital.

In considering the health of the executive, there are three questions which might properly be asked: (1) What is the present status of the health of the executive? (2) Do the executive's occupation and habits shorten his life and decrease his efficiency? (3) Is the executive particularly predisposed to certain diseases? The answers to these questions are not immediately forthcoming. I wish it were possible for me to prove to you by statistical evidence that the executive's health and life, due to his occupation and mode of living, are in jeopardy, thus to spur you to action; or that, on the other hand, I could console you with statistical evidence showing that the executive's health and longevity are progressing satisfactorily. There are, however, no reliable vital statistics available covering executives as a group. In general, we know that the span of life is increasing. In 1775 the mean length of life was 35 years; in 1900 it had increased to 50 years, and today it is more than 60 years. This result has been largely accomplished by a lower infant mortality rate and improvement in our ability to deal effectively with infections and communicable diseases. The reduction in the death rate has taken place almost exclusively among persons less than the age of 50 years. There has been practically no saving of life among persons past this age. Important progress has been made in the management of certain degenerative diseases, notably diabetes and pernicious anemia, but the incidence of diseases involving the cardiovascular system has shown few signs of diminution. In fact, on the basis of clinical observation and increasing statistical evidence there is reason to believe that the incidence of hypertension, arteriosclerosis and coronary thrombosis is on the increase. We know that cardiovascular renal disease causes the death of 500,000 persons annually in the United States. It is the foremost cause of death today, killing four times as many persons as cancer. The death rate from coronary disease among policyholders of the ordinary department of the Metropolitan Life Insurance Company has increased from 8.5 per 100,000 in 1930 to 28.8 in 1935. These figures cannot, of course, be taken as a true index of the situation, because of the many factors involved, the most notable being the greater ability of physicians to diagnose coronary disease. Nevertheless, the marked upward trend cannot be ignored. Schwartz and Harvey[2] have studied the incidence of coronary disease as found in the Downtown Hospital, which is situated in the heart of the financial area of New York City. They found that the greatest incidence of acute coronary disease occurred within the age group of 45 to 49 years. They also noted that as the activity of the stock market ticker varied, so also did the occurrence of coronary thrombosis. Mondays, Tuesdays and Fridays were the days of predilection for episodes of the disease. It was observed, furthermore, that those persons who rested over the week-end or who enjoyed somewhat quiet forms of diversion were notoriously free from attacks of coronary disease during the early part of the ensuing week. These authors warn us not to draw any conclusion from these observations, but they are indeed interesting and should stimulate further similar studies.

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*Read at the Twenty-Seventh Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, Cincinnati, Ohio, April 14, 1942.

It is my considered opinion, based largely upon clinical experience, that the incidence of diseases of the cardiovascular system is definitely on the increase in the population in general. Moreover, among those persons who earn their living with their minds rather than with their bodies, hypertension, arteriosclerosis and coronary thrombosis are not only a more frequent cause of death than formerly, but they are causing disabilities in a younger age group than ever before. It is, furthermore, my opinion, that unless something is done to stem this tide, this tendency will greatly increase. Nor am I alone in this view. White,[3] in commenting on the increasing incidence of coronary disease, made the following statement, *"My own recent experience . . . has made me believe that the situation is appalling and demands some action on our part. Almost certainly the most effective move that we can make is to call a halt on the world's mad rush of today."*

One group of executives in which the cause of death is known with some degree of accuracy is composed of physicians. Their lives, in respect to preparation, working and living habits, can be compared properly to those of most executives. In 1939, there were approximately 4,000 deaths among physicians, and two-thirds of them were caused by cardiovascular disease. When I was writing this paper the *Journal of the American Medical Association* for February 28, 1942, was on my desk. On pages 749 and 750 are listed the deaths among physicians during the week. They number 66. In 63 instances the cause of death was given. Of the causes, 25% were coronary thrombosis, 17% were heart disease, and 20% were arteriosclerosis. Thus, 38 of the 63 physicians, or approximately 62%, died of cardiovascular disease. It is very unlikely that in any other group of men would the death rate from cardiovascular disease be so high as it is in this group of 63 physicians. Smith,[4] studying the incidence of coronary disease among physicians as compared to the incidence of this disease among members of other occupations, found that coronary disease was five times as high among physicians as among farmers and laborers, and twice as common among lawyers and bankers as among farmers and laborers. He said, "that one can reasonably conclude from this study that occupation does influence the incidence of coronary sclerosis, that the incidence is lowest among those who do manual labor and highest among those who do mental work."

Recently, I reviewed the records of 176 executives of a large industrial corporation who were examined at the Mayo Clinic. The executives of this organization were given the privilege of an annual examination; this was not compulsory and the cost was paid by the company. The plan went into effect about nine years ago. Some of the executives were examined only once; some were examined as many as eight times. In the study the age of each executive was taken to be that given at the time of the first examination. The average was 44.3 years; the youngest executive was 23 years old, the oldest was 65 years old. By reference to Table 1 it will be noted that 23 of the 176, or 13%, of these men had definite hypertension; 31, or 18%, were found to have duodenal ulcer; six, or 3%, had coronary sclerosis and angina pectoris; 13, or 7%, were found to have cerebrospinal or vascular syphilis. In Table 2 is shown the distribution according to age of those having hypertension, and in Table 3 are recorded the smoking habits of the 176 executives.

TABLE I
SOME DIAGNOSES MADE AMONG 176 EXECUTIVES

Diagnosis	Number	Percent
Hypertension	23	13
Duodenal ulcer	31	18
Coronary sclerosis	6	3
Syphilis, central nervous system or blood vessels	13	7
Gout	5	3
Sigmoid or rectal polyp	5	3
Diabetes	4	2
Carcinoma	4	2

TABLE II
INCIDENCE ACCORDING TO AGE OF HYPERTENSION*

Age, years	Number
65	1
56	2
53	2
52	2
51	1
48	1
46	2
45	3
44	2
42	1
41	5
40	1

*Average age of executives, 44.3 years; oldest 65 years; youngest 23 years

I am well aware that no definite conclusions can be drawn on the basis of these studies, but at least certain interesting and rather surprising data were encountered, particularly in view of the fact that but few of these executives considered themselves to be ill, and all were daily engaged in their usual occupations. It seems to me that this study shows an inordinately high incidence of hypertension in a group of comparatively young men. There can be little doubt that in many of these men, in subsequent years, many of the complications and sequelae of hypertension and arteriosclerosis will develop. This trend was noted in a number of instances. It is a well-known fact that the incidence of peptic ulcer is much higher among persons who live and work under intense emotional strain. Results of the study seem to bear this out. The smoking habits were studied because I have felt for a long time that most executives are heavy smokers. Results of this study support this opinion and indicate, furthermore, that if an executive smokes at all, he does not do so moderately. The number of instances of syphilis encountered was surprising, but it need not concern us at this time because I am very sure that syphilis was not acquired as the result of an industrial hazard.

A very frequent notation, made by the consultant on the executive's record sheet, was "Physical and mental exhaustion;" "Energetic driving executive, most indiscreet in drinking, dating and smoking habits;" "Nervous high strung man;" "Nervously exhausted;" "Smokes too much;" "Hasn't had a vacation for two years;" "Patient needs a vacation;" or some similar comment.

One might suspect from what I have said that the executive's health and efficiency are impaired and his life is in danger due to his occupation and manner of living. What, then, is his manner of living? In answering the question one must again rely largely upon observation and impression rather than upon statistical evidence. There can be no denial of the oft-

TABLE III
SMOKING HABITS OF 176 EXECUTIVES*

Cigarettes, number	Grade	Number	Percent
Not recorded	?	22	12
None (nonsmokers)	0	33	19
Five to 10 cigarettes	1	12	7
One pack	2	24	14
Two packs	3	47	27
More than two packs	4	38	21

*Most of the smokers were cigarette smokers, and for those who smoked cigars or a pipe the amount of smoking was roughly estimated in number of cigarettes. Study cannot be highly accurate and is shown only as a general indication of a situation.

repeated assertion that the executive leads a strenuous life. The average executive is likely to have bad working, recreational, eating, smoking and drinking habits. He is frequently nervously and physically fatigued and emotionally tense. His working hours are not governed by union rules, but by an inward drive which we call "ambition" and by intense competition. I know many executives who are now working 14 to 16 hours a day. The recreation of the executive, if he plays at all, is unjudiciously planned, and he goes about it as strenuously as he works. He rushes from his office to the golf club, dresses in a hurry, runs to the first tee, and is as tense on the course as though there were a $100 bet on each hole. The average executive does not have enough regular vacations, and when he does get away from his work for a short time, he tries to get his year's supply of sunshine and exercise in a few weeks, or he takes a long automobile trip, boasting when he returns about how much of the country he was able to see in two weeks and how many miles he drove. Frequently, the executive returns from such a vacation more tired physically and mentally than he was when he started. Week-ends often are spent in too strenuous a manner, rather than in rest and relaxation.

Many executives eat too much. There is abundant evidence that food may harm a person, from the standpoint of both the type and amount of food he eats and the way in which he eats it. Overeating leads to obesity, which is commonly associated with hypertension. Obesity may predispose the person so affected to diabetes. There is evidence that a disturbed utilization by the body of milk and its products, of eggs and animal fats, is responsible in some degree for changes leading to arteriosclerosis. The executive's lunch hour often consists of seizing a sandwich on the run or having a conference while he is eating, and if he belongs to a service club, being bombarded by the singing of songs and much handshaking and back-slapping. A noon hour spent in this manner leads to various types of functional indigestion and deprives the executive of a much needed period of rest and relaxation.

Most executives smoke excessively. There is much evidence that smoking does many people harm and that it probably does no one any good. Much is known about the effects of the smoking of tobacco on the human body. It impairs the circulation in the skin of the peripheral parts of the body by causing arteriolar constriction. Physicians who are called upon to treat diseases of the peripheral arteries, such as Buerger's disease, insist that their patients stop smoking at once. Furthermore, smoking of tobacco causes diminution in the size of the small retinal arteries. The blood pressure of many people will increase temporarily after smoking. I have observed the systolic blood pressure increase 50 mm. of mercury in a person who was particularly sensitive to tobacco after he smoked two cigarettes. Nicotine is found in the blood and urine of persons who smoke excessively. They are, in fact, chronically poisoned by nicotine. Many transient physiologic disturbances promptly disappear on cessation of smoking.

One cannot conclude from these observations that the smoking of tobacco produces organic disease, but such a conclusion is not an improbability. Smoking causes an "epinephrine-like" effect within the body. It is well known that repeated injections of epinephrine, which causes as we know a temporary increase in blood pressure and an increase in pulse rate, cause arteriosclerosis; and that the repeated injection of choline, which has a similar action, causes sclerosis of the coronary arteries in animals. It cannot be proved conclusively that smoking shortens life, but the studies of Dr. Raymond Pearl at Johns Hopkins would seem to indicate that this is true. He found that of 100,000 heavy (more than 10 cigarettes a day) smokers, 53,000 died before the age of 60 years. Among the same number of non-smokers, only 43,000 died before that age. The conclusion seems inescapable that smoking does shorten life. The evidence, however, has been questioned. Does the smoking of tobacco shorten life, or do persons predestined to have relatively short lives by virtue of heredity, disposition, stresses and strains of life, and the like, smoke more because of their peculiar dispositions? I do not know the answer, but I am certain that the executive who has even early evidence of hypertension or coronary disease, or a family history of hypertension, arteriosclerosis, apoplexy or coronary thrombosis, will do well to stop smoking.

Excessive use of alcohol has not been a great industrial hazard among many of the executives whom I have known. Chronic alcoholism is rare, an observation which is to be expected because the excessive use of alcohol is not consistent with elevation to and the holding of important executive positions. There is no acceptable evidence that the moderate use of alcohol does harm to the body, although results of Pearl's studies indicate that the excessive use of it seems to shorten life. I believe that people die of excessive eating more than they do of excessive drinking. As far as the executive is concerned, I am not so much concerned with the detrimental effects that the moderate use of alcohol may have on the body as I am with the question of why it is that the man drinks. The executive is so frequently harassed, depressed and exhausted by his environment that he feels the need of alcohol to lessen his muscular fatigue and relax his tired mind. He uses alcohol to escape situations with which he feels unable to cope, or to bring some cheer into a life which is filled with anxiety and constant strain. This is, to be sure, a poor brand of philosophy, but it works temporarily.

IN ANSWER to the questions which I have earlier propounded, one may at least suspect that the health of the average executive is not all that could be desired; that his occupation and habits shorten his life and decrease his efficiency and that his occupation predisposes to certain diseases.

At this point someone may say, "Certainly, executives don't live as long or as healthily, but this is not because of the work they do; rather, it is because of some inherited chromosomal urge that drives them to positions of power and also drives them to ill health and destruction." There is much in such an attitude that can be defended with logic, but I prefer not to accept such a fatalistic attitude. I believe that inherited tendencies can be modified, and that if the executive is advised of certain rules of health and is willing to abide by them, his life can be prolonged and his efficiency increased.

How then shall we as physicians go about our task of properly advising the executive? There is much to be said in favor of the periodic health examination. Properly carried out, such an examination not only gives an index of the status of the health of a person at the time, but also offers the physician the opportunity of promptly noting early evidences of disease. I believe this can be carried out best in the hands of a well-organized group rather than by one physician, no matter how capable he is. The examination, however, should be directed, and advice should be given to the patient after the data have been assembled, by one physician, who should have a deep interest in and

thorough understanding of the executive's problem.

One of the most important parts of the periodic examination of the executive is the taking of a detailed history. The family history may provide information as to inherited tendencies which can be avoided or at least ameliorated by the following of proper advice. If, for instance, the executive had many ancestors whose lives were terminated at a comparatively early age by apoplexy and coronary thrombosis, he would be well advised to live an orderly life as far as rest, relaxation and moderation are concerned. Furthermore, in obtaining the history, the physician must take sufficient time to know in detail what type of work the executive does and how he goes about it. Is he calm and collected, or does he waste nervous energy by emotional outbursts and "flying off the handle," so to speak?

By a thorough understanding of the executive's emotional and physical make-up, the physician will be best able to advise him regarding the type of vacation from which he will derive the most benefit. The executive's vacations should be planned as far as possible so as to relieve the strain when it is most serious. In northern or so-called temperate climates characterized by nothing but intemperance, the habit of taking a vacation in the summer has nothing to recommend it except habit. December, January, February, and March are the months in which the death rate among executives is highest. This is not accidental; it is the time of year in which great strains are exerted because, in addition to the rigors of their work, executives are fighting their environment. For many executives a winter vacation in a warm climate is first-class insurance.

It is probably true that many executives will derive more benefit from periodic short vacations than from one long vacation each year.

The executive should be advised as to exercises to be performed according to his physical capabilities. Most executives require more exercise than they get, but exercises should be judiciously planned. It is obvious that exercise and what we loosely call "play" must be combined in such a way as to bring about pleasure. No one gains relaxation from doing something that he dislikes. Even in recreation the executive frequently retains his competitive instincts. He must be beating something or somebody. I see no objection to this, but he should not go about it as if his life and financial security were at stake.

The history of the executive, furthermore, should include a searching inquiry into the various systems of the body. In addition to routine laboratory studies, investigations should be carried out which will aid in evaluation of the condition of any organ from which symptoms have arisen. The advisability of routine roentgenologic examination of the stomach and colon so that an early malignant process can be detected, should receive consideration even though the patient may be free from digestive symptoms. A routine electrocardiographic tracing is important, not so much from the standpoint of a single tracing, but for comparison with subsequent tracings.

It is obvious that a careful physical examination is extremely important.

The executives of this country have been working at what has seemed "top speed" for years. But now, because of the national emergency, speed must be increased even more. That this is going to have a deleterious effect on health in high places can hardly be doubted. The younger generation, the oncoming executives, have been asked to speed up, and they are highly enthusiastic about doing their share. Colleges are continuing work through the summer. More work is being crowded into shorter periods. Vacations are omitted or markedly shortened, two weeks of examinations are crowded into one, with tests conducted evenings and on Sundays. The wisdom of this procedure might be open to serious question. The education of a person takes time—time for contemplation, time for adjustment to maturity and for the "seeping in" of knowledge. One may properly question whether by these methods we are at an early age instilling into the younger generation the habits of hurry and tension, and whether the finished product will be all that we desire.

There can be no doubt that in recent decades there has developed a change in emotional attitude. It seems to me that this trend has come about largely since the beginning of the first World War, during which a decided change in our general tempo and mode of life took place. In the years since that time a marked increase in industrial activity has occurred with a natural concentration of a greater proportion of our population in large cities. Life has been greatly accelerated by the development of the automobile and airplane. Smoking, and particularly the smoking of cigarettes, has increased tremendously, and the same is true of the use of alcohol. The home as the social center has largely disappeared. Crime and insanity have increased. And what have we gained? Material things? Yes! More automobiles, ice-boxes, radios, bathtubs; but we have gotten into serious trouble, too. The "good life," the "*gemutlich* life" has disappeared. Lin Yutang, the Chinese philosopher, has said that "Americans have too many goods and not enough good."

Of course, it is obvious that many of our ideals are pretty largely scattered to the four winds in the presence of war.

The executives of this country, as I know them, are willing and anxious to give every ounce of strength, ability, energy and even life itself, if necessary, to the successful completion of the tremendous job ahead. I am one of those who firmly believe that we will eventually win the war. But does anyone think that the signing of the peace treaty will end our troubles? They will have just begun. Our country will, as never before, require the services of keen minds and sound bodies. These must in some way be conserved; good judgment must not be replaced by hysteria. Overtaxed minds and bodies are not the most efficient agents for the job, and unnecessary sacrifice of life is not the most efficient way of doing the job. Life can be more efficient and more productive if there is some abiding by the laws of nature. Pauses for rest and relaxation are in no sense of the word periods of wasted idleness. If the job ahead is left to those whose cerebral arteries and decrepit bodies have long outlived their usefulness, centuries will have passed before we recover from this debacle, if perchance we ever do.

Finally, I realize that I have asked too many questions and given too few answers; that I have had to rely too much upon fancy and too little upon fact. But if I have stimulated someone to think on the subject of "the health of the executive," my mission will have been fulfilled.

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American Association of Industrial Physicians and Surgeons

The Convention

THE KEYNOTE of last month's annual meeting in Cincinnati was seriousness. The attendance was a little less than that of the meeting last year, but it was completely representative of the companies engaged in industry's part of the war work. The Arrangements and Program Committees did a good job; the sessions were especially well attended; they began on time; and the subjects and the speakers commanded hushed attention. An unusual feature was the liveliness of several of the discussions. At the annual dinner DR. CLARENCE D. SELBY, of General Motors, Detroit, whose outstanding record as a leader in the progress of industrial medicine has brought him many honors, found himself the recipient of the highly-prized WILLIAM S. KNUDSEN Award for 1941-1942.

At its business meeting the Association, recognizing the long service rendered by DR. VOLNEY S. CHENEY in its behalf, sent him a token of appreciation in the form of a bronze plaque "For Loyal Services as Secretary-Treasurer, 1915-1941."

The exhibits, scientific and commercial, were excellently chosen and well displayed. This year perhaps more than ever there was manifest the interest of the attending physicians in, particularly, the commercial exhibits; many have expressed themselves since as having found the time spent in viewing the new developments and talking with the manufacturers' representatives, productive of valuable information and suggestions.

The first, second and third prizes went to scientific exhibits as follows: DRS. H. E. UNGERLEIDER, R. N. DALEY and RICHARD GUBNER for their "Evaluation of Heart-Size Measurements"; DR. WILLARD MACHLE, E. W. SCOTT and E. J. LARGENT for their "Fluoride Intoxication"; and DR. J. J. WITMER for his "Study of Sick Absenteeism."

The newly elected officers and directors are listed on page 4 herein.

A NOTE of sadness came with the news of the passing of DR. THOMAS R. CROWDER, head of the Department of Sanitation and Surgery for the Pullman Company since 1915. DR. CROWDER died on April 16, the fourth day of the convention, at age 70. Identified with the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS since its organization—he was one of the signers of the original statement of incorporation—his interest in the organization and the field of practice it represents was always close to his heart. He was among the best known of the members, and wherever he was known he was deeply respected and universally loved. His departure leaves a void it will not be easy to fill.

Committee on Psychiatry

YOUR committee has carefully considered the various phases of Psychiatry in Industry, and report to you that we would like to send the following letter to each member:

IT IS with reluctance that I add to the already heavy burden of the industrial physician. However, the stringency of war conditions makes it imperative that I bring to your attention the work our Committee is mapping in the field of the highly important industrial psychiatry. While the time is short, we are making every effort to avoid the "too little and too late" fault in a branch of *medicine* which has proved itself so highly effective under war conditions abroad.

Therefore, this preliminary appeal is being made to you with the conviction that whatever program can be evolved should, in the final analysis, be administered or supervised by you and your colleagues.

Dr. Clarence D. Selby, made the following statement at a meeting of the National Research Council, in Washington, March 19, 1941:

"In the handling of medical problems, the doctors counsel with the employees and render services according to circumstances. In the handling of personal problems they may just listen, and in many instances that seems to be sufficient—but there are times when they can be helpful and are. The personal problems which are mostly worries, and the usual medical responses can be classified as follows:

1. Occupational diseases and injuries:
   (a) The doctors render service.
2. Personal health problems and those of their families:
   (a) The doctors advise, but not to the extent of interfering with private practice of medicine.
3. Personal worries:
   (a) The doctors listen attentively and sympathetically and advise if they can.
4. Problems in the plant:
   (a) The doctors may refer these to the proper departments for consideration if they have the employee's permission.

"This is a valuable service. It should be encouraged. It is on the borderline —if not actually in the field of psychiatry — but whether it should be brought out into the open as such, is a question. Perhaps not, for the reason that it is natural to the patient-physician relationship and is a concomitant of physical examination and other recognized medical department activities. However, the doctors themselves can well be made more conscious of their opportunities in this direction. The problem is to make them so."

Further material is now in preparation in the form of an annotated bibliography which will contain all material pertinent to the problem and will be available shortly for your reference and such study as you care to give it.

May I again call your attention to the growing importance of this problem under the stress of a war time industry. The Committee will keep you informed of its progress and new developments.

—LOYAL A. SHOUDY, M.D., Chairman, Committee on Psychiatry, American Association of Industrial Physicians and Surgeons.

Members of Committee
DR. LOYAL A. SHOUDY, Chairman
DR. C. H. WATSON
DR. LYDIA G. GIBERSON

From Hawaii

OWING to events since December 7, 1941, our regular meetings had to be temporarily suspended, but we are now meeting as previously. On April 4, 1942, our annual meeting was held at the Naniloa Hotel in Hilo. Officers for the coming year were elected as follows: DR. THOMAS KEAY, Pepeekeo, Hawaii, President; DR. W. N. BERGIN, Laupahoehoe, Hawaii, Vice-President; DR. H. M. PATTERSON, Olaa, Hawaii, Secretary-Treasurer. The principal topic of discussion was medical preparedness. For over a year our medical societies have been studying the problems of medical preparedness. Sometime ago when letters came from the A.M.A. recommending certain programs for all communities our answer was that we had had such programs under way for many months. Each county medical society had elected a preparedness committee last May and, on this island, three out of five members of this committee, DR. THOMAS KEAY, DR. L. L. SEXTON and DR. H. M. PATTERSON are industrial physicians. What has happened since December 7, 1941, has proved that our efforts were well-spent and that we are in general well prepared.

This island is the largest of the Hawaiian group and is almost entirely concerned with the growing of sugar and cattle. The sugar plantations are scattered around the edges of the island, with ranch lands on the slopes of the large central mountains. Nearly all the sugar plantations have hospitals, staffed by one or more physicians. All these physicians are members of our Hawaiian Society of Industrial Physicians and Surgeons. Today each of these men is directing a well-planned emergency medical air program for his district. Aside from training of personnel and securing equipment and supplies, this program includes in many cases expansion of existing hospital wards.

About eight months ago the Territorial Medical Association began publication of a "Territorial Medical Journal." The January issue is concerned with the medical problems of December 7 and immediately thereafter, and should be of vital concern to all American physicians and surgeons. H. M. PATTERSON is associate editor of the Journal for the Island of Hawaii.

At a recent meeting of the Hawaii County Medical Society the following industrial physicians were elected as officers in this society, which is made

Continued on page 244

Industrial Medicine
Reg. U. S. Pat. Off.

The Journal of Traumatic Surgery and Occupational Diseases

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The Railway Surgeons

FORTUNATE it is for the Allied Nations and their war effort that the railroads of the United States were ready when called upon. It can be said for them as a whole that they absorbed the initial shock of the war demands with probably less flurry than any other industry; and that they are continuing to meet the added strains of doubled-up requirements in a manner thoroughly in keeping with their long tradition. Quietly and effectively they have been going about the business of more ton miles and more troop miles than it was ever thought their steel tires could handle—and all at an accelerated pace which undoubtedly will go still faster before there is any slowing. All of this, of course, has resulted in more men, and now the total of railroad employment is at its peak.

For the railroad physicians and surgeons more men and faster miles have meant that the physical fitness of the employees in their charge, so necessary in railroad operation, is now imperative. Like the physicians and surgeons in other kinds of industry they, too, are encountering new problems and are finding accentuations of the old. In autumns past the annual meetings of their organization have been interesting forums for the explanation and discussion of their problems and how they solved them. This year, in the midst of total war and under the terrific pressure the times are putting on the human body and its directing mind, the Fifty-Third annual meeting of their AMERICAN ASSOCIATION OF RAILWAY SURGEONS to be held at the Palmer House in Chicago, September 10-12, 1942, should reach a point in present advantage and permanent value comparable to the unparalleled performances of the men and organizations which are the objects of their professional loyalties.

This meeting is something to plan for. No one who can possibly attend it should omit to do so. The program and the arrangements under the direction of DR. HANSEN, DR. METZ and DR. KEPNER promise a new high in all the features that have made the previous meetings of this group so remarkably worth while. The exhibit features, both technical and scientific, already assure a superlative display of the new and timely—particularly valuable in view of the fact that so many detail men who heretofore could be depended on to furnish direct information about advances in the field have been called into service.

Dental Service

AMONG the many repercussions to DR. HOOPER'S article on "Dental Service in Industry," in INDUSTRIAL MEDICINE for April, comes the suggestion that possibly the inertia regarding oral sepsis among industrial workers as to its discovery and treatment is not characteristic solely of industrial physicians. Not long ago an employer, weighing the advisability of spending $6500.00 on an athletic set-up for his employees, as against a dental program, decided on the latter. He was told to consult the local dental association committee for plans and procedures. He did so, and afterward went ahead with the athletic program. He gave as his reason the attitude of the committee members: "If the consensus of their reactions were put in one expression, it would be this: 'We don't think we'd like to have our offices cluttered up with employees from your plant'."

On the industrial-medical side of the picture, the medical officer of one large industry, having read the article, has already begun to require dental x-rays of each employee coming in for periodic examination.

All This and More

SO MANY articles about the industrial nurse, and directed at her, are emphatic in insistence on "ought" and "should!" One wonders if any nurse can measure up in all the many respects in which these injunctions are used. Numerous as they are, however, there is deep signifiance in the fact that a very great many industrial nurses are measuring up—cheerfully, successfully, and routinely. And industrial nurses are all of a class wherein it is the rule that what one can do, another can.

One characterization of the industrial nurse which combines recognition with injunction—which couples the acknowledgment of what the industrial nurse is doing with only a minimum of "ought" and "should"—is the following from DR. SAPPINGTON'S "Industrial Health—Asset or Liability":

1. She is the health instructor *par excellence* on the first line of defense against inefficiency, lost time, and disease.

2. She will often be the means of convincing the management that a physician is a necessary part of industrial health service.

3. She will ever be a willing assistant in the extra-medical activities of industrial life.

4. She should be placed on a footing with other department heads, if the best results are to be secured.

5. She must be more than a graduate nurse.

"THIS SHIP WAS NEVER BUILT!"
*The billion and a half man-hours lost last year through work accidents were sufficient to build: 44 battleships, 375 destroyers, 450 submarines, 195,000 light tanks or 75,000 fighter planes.
*From figures issued by official sources

HEAT-FAG is Directly Responsible for Many Accidents . . . STOP THIS COSTLY TOLL!

The finger of Accident is always beckoning to the fatigued, inalert worker. That's why Heat-Fag, ever-present when men sweat, takes such a staggering toll in man-hours lost to industry. For, body salt lost by sweating must be replaced or Heat-Fag sets in. Lowered efficiency, fatigue and discomfort follow . . . workers become careless . . . accidents happen . . . priceless man-hours are sacrificed.

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FREE Sample Tube Write—on your firm letterhead — for a pocket size sample tube of Morton's Salt Tablets and for the new folder — "Heat-Fag and Accidents Ride Together."

EVERYONE WHO SWEATS NEEDS SALT

Grandmother Survived

THE American Association of Industrial Physicians, in convention in Cincinnati, has gone on record that this war is a threat to the country's next generation. The conclusion is based on the estimate that 5,000,000 mothers and potential mothers will be doing war work before the end of this year, that women are twice as susceptible to disease as men, and that this added susceptibility increases further with marriage. This last condition, it is maintained, entails another job; for the physicians hold that the woman rushes home after eight hours of work, gets dinner, washes the dishes, rises early, gets breakfast, and rushes off to work again. With due deference to a superior knowledge on what makes the fair sex tick, we beg to differ on that double-job business; we are sure that most young husbands who are also working help with the dishes, help with the meals, maybe cook them more often than the ladies; and if the baby is to come, the husband will have seen to it that the young mother has quit her job in plenty of time. In fact, it is the duty of these industrial physicians to see to it that the new baby gets a fair chance. War work, as it is being arranged for women, is fairly clean work, carried out under rigid rules in the matter of health safeguards; seeing to this has been another of the duties of the industrial physicians. Rougher work, tougher work, dirtier work and harder work never did these girls' grandmas any harm and—purely as a result—has not done their mothers or themselves any harm. We beg leave to think that the Association of Industrial Physicians is unduly worried—maybe over the added work that is going to pile up on them when those 5,000,000 gals get going. But, as we said about the gals themselves, hard work never did anybody any harm.

—Editorial, *Chicago Sun*, April 20, 1942.

But grandmother never had to run a lathe.

An Inaccurate Analogy

ACCORDING to an Associated Press news dispatch from Washington, "President Roosevelt had a snappy comeback to an economist who told him that 30 million man hours of work had been lost by strikes in the last year and three-quarters and that the Japanese would not have taken Singapore and the Dutch East Indies if this time had been saved." The snappy come-back, as reported by the Associated Press, consisted of the President's observation that if it weren't for the common cold we would have been in Berlin today—60 million man days were lost in a year through the common cold. The analogy is slightly faulty. Medical scientists are making considerable progress in reducing the ravages of the common cold. The administration is making no progress—is losing ground in fact—in reducing the time lost through strikes.

—Editorial, *Reno Evening Gazette*, reprinted in *Chicago Tribune*, May 2, 1942.

If industrial physicians knew of any way to prevent the common cold, there wouldn't be any.

HEAT can sabotage production . . .

Keep your workmen in top form during hot weather with Walker's Dexaline—the improved salt tablet. Each tablet contains not only 7 gr. sodium chloride (to prevent dehydration), and 3 gr. dextrose (to increase sugar energy level) . . . but also 1 mg. vitamin B_1 (specially helpful in protecting against heat exhaustion). Economical and effective. Write for samples and literature.

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INDUSTRIAL HEALTH AND DISEASE

United Aircraft

—Report on Foodex Survey—

THE feeding test and surveys covered by this report were organized and conducted by Prof. Howard W. Haggard, Director of the Laboratory of Applied Physiology, Yale University, and by his staff. The results indicated in this report have been compiled by Dr. E. M. Jellinek, noted statistician, selected by Prof. Haggard. The results covering increased standard labor value of production per man, decreased absenteeism, decreased spoilage of materials, etc., are based on records supplied by the Pratt Whitney Company. The results covering health benefits and other comparative information are based on written questionnaires for the months of January and February, 1942, filled out by the workers taking Foodex daily. No sales or pep talks on Foodex were given, nor was sales literature distributed in connection with the feeding test. The questionnaires were filled out by each worker in writing. Verbal questioning was deliberately avoided to insure greater objectivity and hence accuracy of answers. No representative of the manufacturer of Foodex had any communication, conversation or contact with the men taking it. Several men on Prof. Haggard's staff personally supervised the daily distribution and feeding on each of the three shifts. The following is from the report:

FOODEX was given to 506 men in Department 10 from January 2 to February 28. Week-by-week production and absenteeism records for this department were made available for the eight weeks preceding the experimental period, that is, from November 7 to January 1, as well as for the eight weeks covering the experimental procedure. Such records have also been obtained for Department 110 (around 650 men, on the average) who did not receive Foodex but who, since they perform the same work as the men in Department 10, serve as controls. Supplementary to these objective records, questionnaires were given to the men in Department 10 at the end of the first and at the end of the second experimental months. (The results of the first questionnaire have already been reported on.) The questionnaires related to any difference that the men may have observed as to duration of sleep, feeling of restedness in the morning, fatigue at end of work, production, alertness, appetite, digestion, colds, minor ailments, feeling of fitness, and nervous tension.

Production Records

SINCE the routine records of the factory give the number of men on the payroll irrespective of whether they had worked or were temporarily working in another department, the management was requested to give us the number of hours of work paid for in Departments 10 and 110 for the pre-experimental as well as the experimental period. It may be mentioned that data were furnished for 16 weeks preceding the experiment, but in our comparisons we have used only the eight weeks immediately preceding the experiment in order to have entirely comparable periods. The number of hours worked was divided by eight, giving the number of man days worked. The production in terms of standard labor value, and spoilage in terms of the value of spoiled material are given by us as per man day worked. The number of days lost through absenteeism is expressed as days lost per thousand man days worked. Thus this item can be compared directly for the two departments as well as for the two periods.

In discussing changes in production and absenteeism we shall speak of significant and insignificant changes. This is to be understood in its statistical connotation, significant difference meaning that the difference, according to probability, did not arise from chance, while insignificant difference means that the difference lies

DEFENSE WORKER

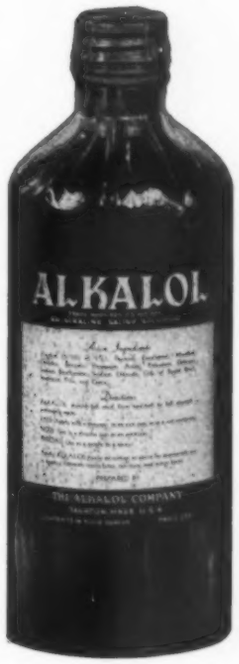

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TABLE 1
BASIC PRODUCTION DATA

	Department 10 (Experimental) Nov. 7, '41—Jan. 2, '42	Jan. 1, '42—Feb. 26, '42	Department 110 (Control) Nov. 7, '41—Jan. 2, '42	Jan. 1, '42—Feb. 26, '42
Man days worked	23,619	25,525	30,195	31,871
Production: Standard labor value	$221,307	$258,127	$243,919	$272,915
Value of spoiled material	$ 18,330	$ 11,227	$ 22,062	$ 21,744
Number of days lost	860	950	1,256	1,615

within chance fluctuations.

The basis data for the two departments for the pre-experimental as well as for the experimental period are given in Table 1.

Computing production in terms of standard labor value per man day worked, values as given in Table 2 are obtained.

It is seen that an increase in individual production in terms of standard labor value has taken place in both departments in the period January 2 to February 26 as compared with the preceding eight weeks. Around January 1 a revamping of procedures took place and through this or the increased drive due to entry into the war a general increase in individual production may have occurred. This we shall call the internal factor. It is seen that the control department (110) increased 5.9%

TABLE 2
STANDARD LABOR VALUE OF PRODUCTION PER MAN DAY WORKED

	Department 10 (Experimental)	Department 110 (Control)
Pre-experimental: November 7, '41—January 1, '42	$9.37	$8.08
Experimental: January 2, '42—February 26, '42	10.11	8.56
Average	Plus 7.9%	Plus 5.9%

in individual production but the experimental department (10) increased 7.9% which is 33.9% higher than the rate of increase of the control department. This higher rate of increase took place in spite of the fact that the men in the experimental department had been producing, previously to the experiment, at a higher level than those in the control department, that is, they had already been nearer their individual potential production limits. Increased production was also reported subjectively by 46% of the men in the experimental department. The difference in the percentage increase between the experimental and the control departments may be attributed to the experimental factor (Foodex). This in itself may not be regarded as the full contribution of the experimental factor toward increase in production. We shall evaluate this step by step.

Here, too, greater efficiency is shown in both departments, that is, the so-called internal factor was operative here, too. But while the decrease of spoilage per man day was only 6.8% in the control department, it amounted to 43.6% in the experimental department, and this difference must be attributed to the largest part to the experimental factor. This is an

TABLE 3
VALUE OF MATERIAL SPOILED PER MAN DAY WORKED

	Department 10 (Experimental)	Department 110 (Control)
Pre-experimental: November 7, '41—January 1, '42	$0.78	$0.73
Experimental: January 2, '42—February 26, '42	0.44	0.68
Average	Minus 43.6%	Minus 6.8%

expression of the greater alertness which was reported by 38% of the men in the experimental department at the end of the 8 weeks of administration of Foodex. The difference between the two departments in the pre-experimental period, with respect to spoilage of materials, was insignificant, while in the experimental period the difference is highly significant.

Days lost through absenteeism are an important item in production. Table 4 gives the number of days lost per thousand days worked.

TABLE 4
DAYS LOST PER THOUSAND DAYS WORKED

	Department 10 (Experimental)	Department 110 (Control)
Pre-experimental period: November 7, '41—January 1, '42	36.4	41.6
Experimental period: January 2, '42—February 26, '42	37.2	50.7
Change	Plus 2.2%	Plus 21.9%

Since the experimental period (January-February) is a worse period for illness, especially colds, than the pre-experimental period (November-December) which is used for comparison, a considerable increase in days lost was to be expected for the experimental period. In the control department the number of days lost per thousand days worked actually increased by 21.9%; but in the experimental department it was only 2.2%, that is, the increase in days lost in the control department was roughly 10 times as great as in the experimental department. This difference is highly significant, while in the pre-experimental period there was no significant difference between the two departments.

Through the smaller loss of days in the experimental department, 172 man days were saved, that is, a saving of 20% in absenteeism. This bears out the subjective reports of the men in the experimental department to the effect that they had experienced fewer colds since taking Foodex than ordinarily.

We shall attempt now to evaluate the role of the experimental factor in production. The production in terms of standard labor value in the eight weeks experimental period in the experimental department (No. 10) showed an excess of $36,820 compared with the preceding eight weeks. We account for this excess by various factors. In the first place there were 1,906 more man days worked, owing partly to increase in payroll, partly to increase of work-days per week. However, 172 days out of these 1,906 days must be attributed to the saving effected by reducing absenteeism which, as shown previously, was due to the experimental factor. Deducting these 172 days, the remaining 1,734 days are credited with the per man day production value of the pre-experiment period, since the difference between the pre-experimental and the experimental per man day production value is allotted under two other headings, namely, the increase of 74c per man day of production value is divided into 55c due to the internal factor and 19c due to the experimental factor. This is computed on the basis of the figures given in Table 2. The 172 days saved by the experimental factor are credited with the full per man day production value of the experimental period since they are due entirely to the experimental factor. The breakdown is shown in Table 5.

Thus the total contribution of the experimental factor to the excess earnings was 17%. This, however, is only the first approximation toward evaluation of the role of the experimental factor in production, since Foodex was given for two months only and its effects could become fully manifest only after a protracted period. That this is not merely a surmise is shown in Table 6, which

TABLE 5
ROLE OF THE EXPERIMENTAL FACTOR IN PRODUCTION

	Dollar	Per Cent of Total Excess Production
Additional man days (1,734 @ $9.37)	$16,247.56	44.13
Increase in labor value per man day due to internal factor (25,353 man days @ $0.55)	13,944.15	37.87
Days gained through experimental procedure (Decrease in expected loss of days, 172 @ $10.11)	1,738.92	4.72
Additional increase in standard labor value per man day (25,353 man days @ $0.19)	4,817.07	13.08
Not accounted for, due to dropping of fractions in standard labor value per man day	72.30	0.20
	$36,820.00	100.00

gives the per man day production value for each of the eight weeks of the experimental period for both Departments, 10 and 110.

It is seen that in Department 10 (experimental department) the first week shows an extraordinarily high value, owing perhaps to the psychological effect of Foodex administration. In the second week the production value drops, and from then on increases week by week to very high levels. That this is not a factory trend but due to the experimental factor can be seen by comparing the weekly values of the control department. The control department shows no systematic trend, merely ups and downs, and the last three weeks actually show drops. It is also interesting that any psychological value which might be attributed to the administration of Foodex is washed out after the first week, and thereafter only true physiological effects are shown.

TABLE 6
WEEK BY WEEK STANDARD LABOR VALUE OF PER MAN DAY PRODUCTION DURING THE EXPERIMENTAL PERIOD

Week Ending	Production Value, per Man Day, in Dollars: Department 10 (Experimental)	Department 110 (Control)
January 8	11.83	8.70
15	8.51	8.11
22	8.74	9.41
29	9.04	8.27
February 5	9.86	9.45
12	10.02	8.70
19	12.00	8.43
26	10.92	7.34

The Questionnaires

A REPORT on the analysis of the first questionnaire was submitted a month ago. In that report the numerous questions were dealt with and the data were analyzed separately for each of the three shifts. In the present report it will suffice to compare certain items of the first and second questionnaires (one month and two months after beginning administration of Foodex). The second questionnaire contained fewer questions than the first, since it was found that the questionnaire could not be administered by the observers but had to be given to the workers for filling in. Of the first questionnaire, 474 were returned, and of the second, 456. Table 7 shows the comparison of the first and second questionnaires. Relative to the feeling of restedness after sleep and to alertness, about the same percentage of improvement was reported at the end of the second as at the end of the first month. For production, fatigue at the end of work, appetite and colds, however, there was progressive improvement. Especially noteworthy is that while only 36.9% of the men reported less fatigue at the end of the work day in the first questionnaire, 71.2% reported this at the end of the second month. The decreasing incidence of colds was noted in the second questionnaire by 47.6% of the men while in the first one only 13.3% had reported this. This is especially interesting since in February colds are more prevalent than in January.

The progressive improvement indicated in the subjective reports is borne out by the progressive improvement in measured production as shown in Table 6. The production records as well as the subjective statements show that the full effect of Foodex may be expected to manifest itself after several months of feeding only. Any conclusions reached at the end of two months reflect practically only the minimum effect.

—E. M. JELLINEK.

TABLE 7
COMPARISON OF ANSWERS TO QUESTIONNAIRES AT END OF ONE MONTH AND AT END OF TWO MONTHS OF FOODEX FEEDING

Question	First Questionnaire: Unchanged %	More %	Less %	Second Questionnaire: Unchanged %	More %	Less %
Feeling of restedness after sleep	49.6	49.8	0.6	48.5	46.9	4.6
Production	71.1	28.7	0.2	53.7	46.1	0.2
Fatigue at end of work	61.4	1.7	36.9	25.3	3.5	71.2
Alertness	66.0	34.0	0	60.3	38.0	1.7
Appetite	74.9	24.3	0.8	46.3	43.2	10.5
Colds	85.4	1.3	13.3	48.0	4.4	47.6

Dermatitis from Cutting Oils

LOUIS SCHWARTZ
Medical Director, United States Public Health Service

CUTTING OILS are the most frequent causes of dermatitis among machinists and metal workers.

Cutting oils are divided into two large groups, the insoluble and the soluble. The insoluble ones are used mainly as lubricants, aiding the tools in the cutting operation, and the soluble ones are used mainly as cooling agents. Mineral oils and greases are also used in machine shops for lubricating moving parts and for rust prevention. These oils and greases may produce the same types of lesions as the cutting oils.

The soluble cutting oils in general consist of mineral oil about 60 to 95%, soap about 5 to 30%, and volatile matter from 0 to 10%.

The mineral oil content may be a paraffin or naphthenic type of oil. The soap content may consist of sodium or potassium salts, of fatty acids, rosin, sulfonic acids or sulfonated vegetable or animal oils. The soluble oil may contain more than one type of soap and the proportions vary with individual manufacturers.

The volatile contents consist of materials which are used as mutual solvents or cutting agents which stabilize the mixture of oil and soap. They may consist of alcohol or glycol phenol, nitrobenzene, cresol, and similar materials and water. Some of these compounds serve to inhibit the growth of bacteria and fungi in the oil.

The principal function of a soluble oil is that of cooling the cutting tools so that they do not lose their temper and break or chip; the secondary function is that of lubricating. Soluble cutting oils are mixed with water, in varying proportions (3 to 60 parts of water per part of oil) and allowed to flow continuously over the cutting operation.

The insoluble cutting oils—fatty oils, such as lard oil—were first used to lubricate cutting tools. Since petroleum has become generally available, it has been added to or substituted for these fatty oils in order to offset their high cost and their tendency to turn rancid.

Sulfur was chemically combined with the mineral oil-fatty oil blend to increase the film strength and to provide the added lubrication which

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Elkhart, Indiana

was needed for cutting tougher steels and at higher speeds.

The insoluble type of cutting oil consists principally of 55 to 100% of mineral oil, 0 to 30% of fatty oil, 0 to 10% of sulfur, and 0 to 5% of chlorine. The mineral oil content may be of a paraffin or naphthenic type. The fatty oil content may be oleic acid, lard oil, fish oils, and vegetable oils.

The purpose of the fatty oil is to act as a sulfur carrier and to increase the lubricating properties of the oil. The presence of the sulfur enables deeper cuts to be made in the metal without harming the cutting edge. Chlorine performs, in general, the same function as sulfur, but tends to cause corrosion and rusting of steel.

Firms that sell the vegetable or animal oils to the cutting oil manufacturers may incorporate into them chemicals known as inhibitors, which prevent the oil from becoming rancid. These inhibitors must be of a type that will not rust iron and are frequently phenolic compounds of the type of phenolic amines.

The insoluble cutting oils may also contain small percentages of these inhibitors.

Action of Cutting Oils on the Skin

ALL petroleum oils have the property of defatting the skin. The defatting action is somewhat lessened by the animal or vegetable content of the cutting oil, but since these oils are contained in comparatively small percentages in cutting oil, their action does not altogether counteract the defatting action of the mineral oil content.

All oils may plug up pores of the skin and form comedones.

The chlorine content may be sufficiently high to irritate the skin.

The sulfur content of a cutting oil may cause a dermatitis because of the actual effect of the sulfur itself on the skin, or because the sulfur may be converted into such compounds as hydrogen sulfide or sulfur dioxide by the action of the heat generated by the cutting operation.

The animal or vegetable oils, especially when they are rancid, may irritate or sensitize the skin of some of the workers.

The phenols, cresols, nitrobenzene, and other inhibitors are usually not present in sufficient amounts to be primary irritants, but they may act as sensitizers and cause allergic eczemas.

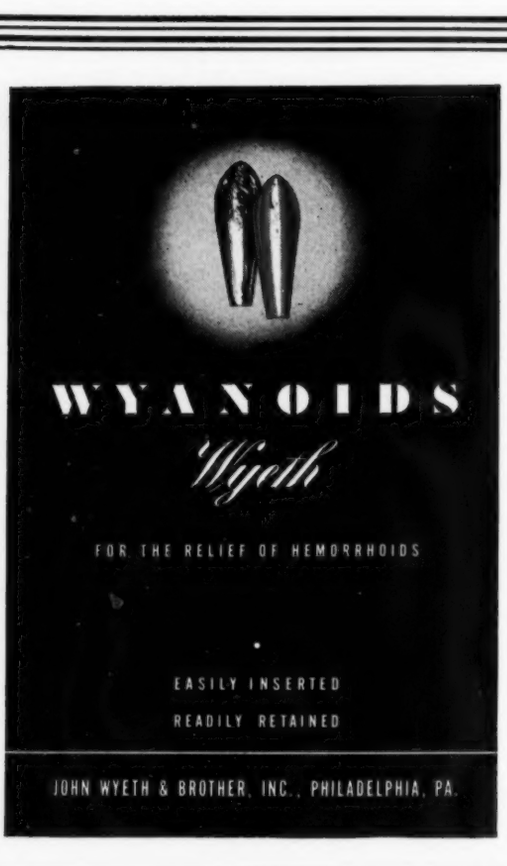
The type of skin has a marked influence on the worker's susceptibility to dermatitis from the cutting oils. A greasy skin having active sebaceous glands is less apt to be defatted than is a dry skin. A smooth, hairless skin is less apt to develop comedones than a hairy one.

Cutting oils, after being used, contain many steel slivers which may wound the skin of the workers, especially if old, dirty towels and old, used waste full of slivers are employed for drying the hands.

Types of Dermatitis

COMEDONES of the hands and fingers occur in nearly all workers handling cutting oils unless they are particularly careful about washing their hands after work. Folliculitis is the most frequent type of dermatitis caused by cutting oils. Folliculitis occurs generally on the extensor surface of the forearms and of the thighs where oil-soaked sleeves and trousers have closest contact with the skin. The bacteria found in the lesions are usually the pathogenic staphylococci, which are usually found in ordinary boils and which may be found on the intact skin. It is true that workers sometimes expectorate into cutting oils and that the oils may even be contaminated with the colon bacillus. However, we believe that it is the bacteria on the skin which causes the folliculitis from cutting oils and not the bacteria which may be in the oil. The U. S. Public Health Service has analyzed samples of sterilized and unsterilized insoluble cutting oils used by workers who have had cutting oil dermatitis and found no significant number of staphylococci or streptococci. A large square-end, rod-like organism containing spores and some indefinite forms suggestive of yeasts and molds were found in the samples.

The insoluble cutting oils as a class are not suitable for the growth of bacteria because they contain such a large percentage of petroleum oil and because many of them also contain an inhibitor which has antiseptic proper-



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ties. Soluble petroleum oils, when diluted for use, are not well suited as culture media because of the fact that they consist mostly of water and a small percentage of the soluble oil. It is possible, however, for bacteria to grow in those having a high content of fatty oils. The lard oils contain animal or vegetable oils and therefore bacteria grow more easily in them. (Lee and Chandler[1] described a short gram-negative rod which they found in cutting oils and which they called *Pseudomonas oleovorans*. This organism has not been shown to be a pathogen.)

Infected follicles may develop into boils and even carbuncles and infection of wounds of the skin caused by metallic slivers may cause the development of boils or even cellulitis. Bacteriologic examination of the infected follicles or boils usually shows the ordinary pyogenic bacteria, which are found in ordinary boils and which are usually present on the skin.

The defatting action of cutting oils on the skin may cause drying, cracking, and fissuring. The open fissures are subject to secondary infection and its train of symptoms—boils, lymphangitis, and even septicemia. Dry skins and senile skins are most likely to be affected in this manner because the skin glands are not sufficiently active rapidly to replace the fat extracted from the skin by the mineral oils.

Metal slivers in the oils and in the waste used for drying the hands often become imbedded in the skin and may be the site of secondary infection.

Some of the mineral oils have keratogenic properties and cause the appearance of small, flat, brownish papillomas on the hands, arms, and other parts touched by the oil or oil-soaked clothing. We have found that about 10% of all workers in oils and greases have these growths. They are usually not troublesome and the worker may not be aware of their presence.

Certain mineral oils are carcinogenic but fortunately the mineral oils of North America are low in carcinogenic properties. Nevertheless a few cases of skin cancer are caused in the United States by mineral oils. Cancers caused by oils are usually of the prickle cell type. They are usually multiple and occur on the parts exposed to the oils or the oil-soaked clothing, the hands, arms, neck, and scrotum. They do not as a rule have early metastases.

Allergic eczemas are the least frequent types of cutting oil dermatitis. They are caused by hypersensitivity to the animal or vegetable oil or inhibitor contained in the cutting oil, or by allergy induced by the disinfectant, which in many instances is added to cutting oils when they become rancid. We have seen cutting oils that contain as high as 5% of a phenolic disinfectant which had been added to it from time to time during the prolonged period that the cutting oil was in the machine.

Dermatitis among workers exposed to cutting oils may not be caused by the cutting oil, but by the harsh soaps, bleaches, and solvents which the workers use to wash their hands after work. Careless workers are apt to use such solvents as kerosene and gasoline to remove dirt and grease from their hands quickly. Others will use sand soap, soaps containing a high percentage of alkali, and even such substances as bleaching powder to clean up after work. Skins that are naturally dry will not stand such cleansers without at least becoming chapped or fissured.

Prevention

PREVENTION of dermatitis from cutting oils consists chiefly in cleanliness of the person, of the clothes, of the machines, and of the oil. For personal cleanliness, workers with cutting oils should be provided with adequate washing facilities, hot and cold running water, and shower baths, and they should be compelled to use them under supervision.

Clean work clothes should be provided daily and the anterior surfaces of the body and the arms should be protected by aprons and sleeves made

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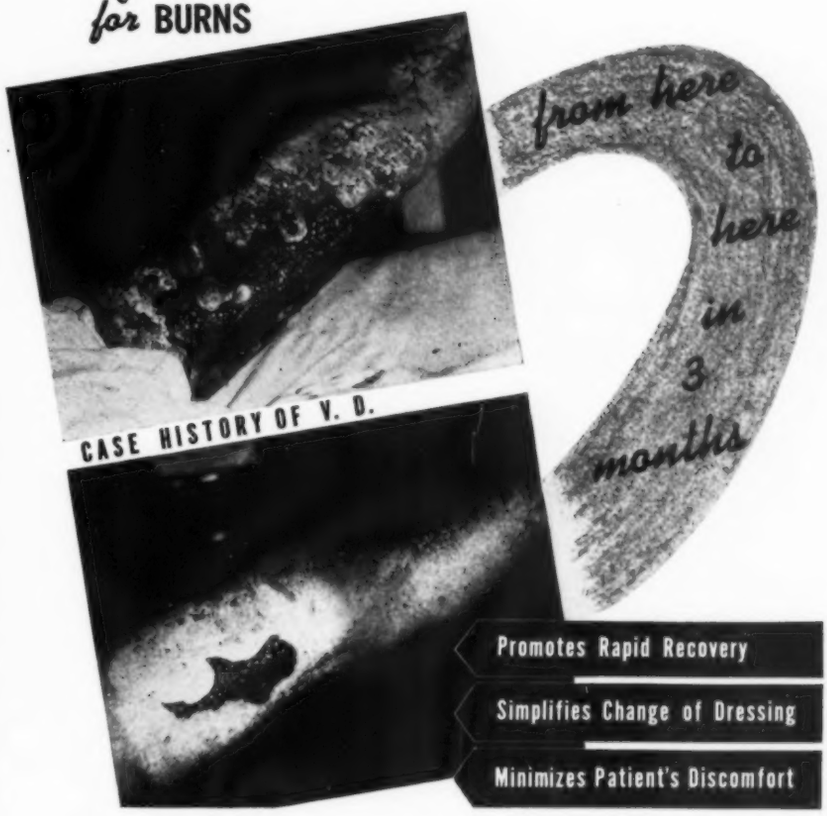

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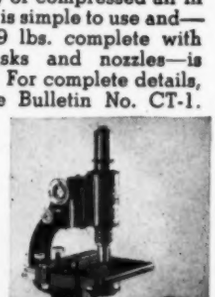

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of impermeable material, such as the new synthetic resins.[3]

Toilet or liquid soaps should be provided for the workers and placed in convenient locations in the wash room. There should also be provided places where workers who have dry or fissured skins, or acute or chronic dermatitis can wash after work with a cleanser that will not further defat or irritate the skin. Such a cleanser has been devised and consists of a neutral sulfonated castor oil, to which 2% of a wetting agent such as a fatty alcohol sulfate is added.[3] The sulfonated castor oil is a good emulsifier and the wetting agent is a good detergent and works in hard or soft water. Its defatting action is counteracted by the sulfonated castor oil. If it is desired to remove dyes or stains from the skin, the addition of 1 to 2% of trisodium phosphate or sodium hexametaphosphate to this mixture will increase its cleansing powers and not materially increase its irritating powers. The use of kerosene, gasoline, or other fat solvents and strong bleaches and scouring soaps should be prohibited for skin cleansing.

The machines should be kept as free from old grease and dirt as possible by washing daily.

The oil should be changed frequently, at least once a week, and either discarded, or, if it is to be reused, it should be screened to remove metal, sterilized to remove bacteria, and neutralized to remove rancidity. Such sterilization can best be done by a central sterilizing system, connecting with each of the machines, and recirculating the oil, or if this is not possible, the oil may be removed from each individual machine and carried to the central sterilizing system. Additional antiseptics should not be added to used or rancid oils. Such a practice increases the irritating properties of the oil and is not necessary if the oil is filtered, neutralized, and heat sterilized.

Clean towels should be given to the workers every day, or they should have free access to clean waste. The towels should be so laundered that all slivers are removed. Waste should be discarded and not laundered because it is impossible to remove all slivers from waste.

Protective Ointments

SINCE the most frequent type of occupational dermatitis caused by cutting oils is a folliculitis and boils, cleanliness is much more important in the prevention of dermatitis than are protective ointments. When protective ointments are used, they should be of the type that will fill the pores of the skin with an innocuous vegetable or animal fat to prevent the entrance of the mineral oil. Such an animal or vegetable fat will also act to protect the skin from the defatting action of the mineral oil, because the mineral oil must first dissolve out the protective ointment before it will act on the fat of the skin. Such a protective ointment should also contain a small percentage of a wetting or emulsifying agent such as the fatty alcohol sulfates, in order to make it easily removable from the skin with water. A small percentage of a harmless preservative, such as sodium perborate, is also desirable in order to prevent the fat in the ointment from becoming rancid.

Protective ointments which form films on the skin, insoluble in oil, are not as good as are those described above, because films insoluble in oil are soluble in water and the perspiration which forms beneath them washes them off. Protective ointments which form films soluble in oil are not desirable because the cutting oil washes them off. The sulfonated oils will wash away both types of films. Films will crack when the hands and fingers are flexed and leave areas of the skin unprotected.

Workers should be prohibited from expectorating into the oil, or from contaminating it in any other way.

Education

THE safety director or the physician in charge of the medical service of the plant should make it his duty to give occasional lectures to the workers as to the hazards of dermatitis from cutting oils and make them acquainted with the methods of prevention outlined above. In this educational program, the placing of

placards in suitable places calling the attention of the worker to the dermatitis hazards of cutting oils and the methods of prevention has been found to be effective.

Differential Diagnosis

CUTTING oil folliculitis and boils must be differentiated from folliculitis, boils, and furunculosis occurring from nonoccupational causes. Cutting oil folliculitis and boils occur on parts of the body where there is most frequent contact with the cutting oils or with soiled clothes. The extensor surfaces of the forearms, thighs, and legs are the favored sites of cutting oil dermatitis. The condition may, however, occur on other parts of the body coming in contact with oil-soaked clothing. Non-occupational boils usually occur on other portions of the body, such as the back of the neck and the back. Occupational folliculitis and boils are usually multiple, whereas non-occupational types are more apt to be a succession of solitary boils or furuncles. In occupational folliculitis and boils, evidences of oil comedones can usually be seen on the parts affected. These do not occur in non-occupational types.

In differentiating the allergic eczematoid type of cutting oil dermatitis from eczemas of unknown origin, the site of the lesions must be considered, as well as the result of patch tests with the oil. Allergic occupational eczemas due to cutting oil usually begin on the arms and hands or on parts of the body which have contact with oil or oil-soaked clothing. Patch tests with the particular cutting oil handled by the worker should be positive if the oil is the cause. Such positive patch tests should be followed with patch tests with each of the ingredients of the cutting oil to determine the actual chemical in the oil to which the worker is sensitive.

Fungus infections and phytids of the hands and forearms offer a difficult problem in differential diagnosis, but here again patch testing in conjunction with the history, site, and morphology of the lesions will usually lead to a correct diagnosis.

Treatment

COMEDONES, folliculitis, and boils caused by cutting oils can be successfully treated by cleanliness and antiseptics. Cleanliness consists in a daily change of work clothes and frequent washing of the parts affected. Pus should be evacuated by surgical means and moist dressings of solutions of boric acid, bichloride of mercury 1 to 1,000, or potassium permanganate 1 to 2,000, if judiciously used, will usually clear up the condition.

The allergic types of cutting oil dermatitis are best handled by removing the affected worker from contact with cutting oils and then treating the dermatitis. Antiseptic lotions should be used for the moist types of dermatitis and ointments for the dry, chronic types. Moist dressings of boric acid, Burow's solution, bichloride of mercury 1 to 1,000, and the like, for the acute moist types, and boric acid ointment, zinc ointment, Lassar's paste, and coal tar preparations are suggested for the dry stages or dry eczematoid types.

For dry, defatted skins an ointment consisting of a vegetable or animal fat should be given the worker to rub into his hands before and after work. The ointment suggested above as a protective may also be used for this purpose.

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Continued from page 16—

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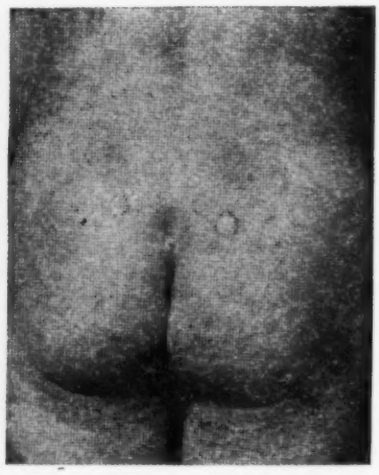

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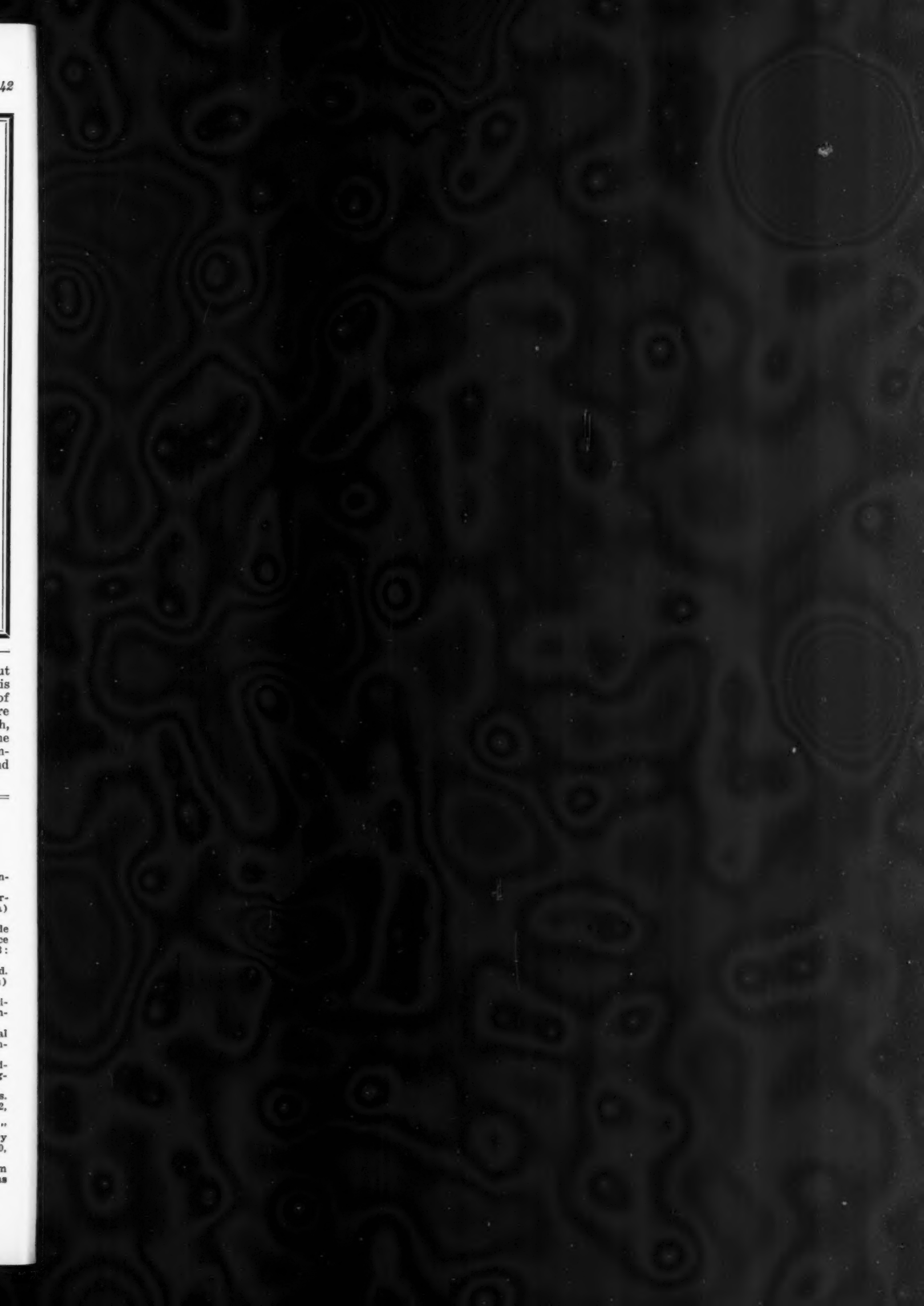
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